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The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The National Ironfounding Employers' Federation
The Welsh Engineers' and Founders' Association
and
The Foundry Trades' Equipment and Supplies Association

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The Acetylene Welding Congress

Elsewhere in this issue we give details of the programme provisionally arranged for the conduct of the twelfth International Congress of Acetylene, Oxy-Acetylene Welding and Allied Industries, to be held from June 9 to 13. It is peculiarly appropriate that the venue should be London, as this year marks the fiftieth anniversary of the industrial production of oxygen and the centenary of the discovery of acetylene gas by Humphrey Davy. This Congress has the support of His Majesty's Government, and the Committee of Honour is presided over by the Rt. Hon. J. Ramsay MacDonald, M.P., the Lord President of the Council. It includes eight members of the Cabinet, the Rt. Hon. the Lord Mayor of London, Sir Frank E. Smith, Secretary of the Department of Scientific and Industrial Research, Sir Harry McGowan, K.B.E., and Sir Harold Hartley, C.B.E., M.C., F.R.S. (Past-President of the British Cast Iron Research Association). Twenty countries are represented on this committee.

From the point of view of the foundry industry, it is particularly unfortunate that there is a complete clash of dates with the Glasgow Conference of the Institute of British Foundrymen. The first international acetylene congress was held in Berlin in 1898. Budapest, Paris, Liége and London were visited during the next decade, and at that time (1908) the delegates visited the oxygen factory at Westminster. In the intervening years, congresses have been held in Vienna, Rome (twice), Paris, Brussels and Zürich. In the early days, the main topic for discussion was illumination, whilst to-day welding predominates. The oxy-acetylene system is used very largely for the minor repair of castings, whilst it also constitutes a serious form of competition to the foundry industry in association with various other types of welding. Time will tend to unite the two processes, resulting in the simplification of the design of castings and the utilisation of welding for the addition of bits and pieces which introduce complicated coring. Whilst but few foundrymen will be able to participate in this Congress, we are sure that they will be unanimous in wishing it every success. As an industry, the foundry looks forward to the time when all prejudice against the reclamation of slightly imperfect castings by welding will be dissipated and that the only desideratum will be whether it is cheaper to repair, or to scrap and make a replacement. Any action the welders can take to bring about this desirable objective will be appreciated, as it is only the prejudice of the engineers which causes the foundry industry as a whole to hide its welding department.

Staff Unemployment Insurance

The Unemployment Statutory Committee, in a report issued on the last day in March, proposes that the salary limit for compulsorily insured non-manual workers shall be raised from £250 to £400 per annum. Something like four hundred thousand workers would be affected, and employers, employees and the State would each contribute to a total of £2,400,000 per annum. Naturally, a proportion of these are in the foundry industry, and probably many grades will be affected. But the situation is not merely one of insurance against unemployment in the ordinary sense. The industrial structure in this country has been built on a basis of the hourly payment of manual labour, and the costs of production are based on there being no necessity for paying for manual labour if it is not actually used. Hence there is everything to be said for insurance against unemployment for manual workers, and this provides against fluctuations in employment in individual firms and in industry as a whole. With regard to non-manual labour remunerated above £250 per annum, this is generally on a staff basis. There is no payment for overtime, but the salary fixed is paid irrespective of holidays or brief absences through sickness. Such employment is usually much more permanent than that of manual labour, and the men concerned represent the skeleton organisation. They are often far busier when trade is poor or even when the factory is closed than when it is running normally. There is, therefore, a fear that regular contributions from this grade will not be needed and indeed will be used to improve the actuarial position of men in the manual grades.

It is therefore not surprising that employers and their associations are opposed to the extension, although employees other than chartered accountants and solicitors seem to be in favour. There is not in principle any objection to insuring what are so frequently termed black-coated workers, but there is no doubt that raising the limit to £400 places an extra burden on industry, and it is doubtful whether the drain on the fund due to unemployment in this section would equal the contributions by the three parties concerned. The scheme does not involve any new administrative machinery, although specialised exchanges for professional workers are mooted. The fact that the Unemployment Fund is now solvent (which has led the Government to reduce contributions by a penny a week as from next midsummer) removes the fear that the new contributions are intended to bolster up an economically unsound scheme. But will not the next step be extended compulsory health insurance?

Twelfth International Congress of Acetylene, Oxy-Acetylene Welding and Allied Industries

DETAILS OF PROVISIONAL PROGRAMME

The Twelfth International Congress of Acetylene, Oxy-Acetylene Welding and Allied Industries is to be held in London from June 8 to 13, under the presidency of Dr. J. Donald Pollock, O.B.E., LL.D. Below is detailed the provisional programme.

Provisional Programme

Monday, June 8.—11 a.m.: Inaugural ceremony at the Guildhall. 2.30 to 5.30 p.m.: Congress sessions at Caxton Hall, S.W.1.

Tuesday, June 9.—10 a.m. to 12.30 p.m.: Congress sessions. 2.30 p.m. to 5.30 p.m.: Congress sessions. 7 p.m. for 7.30 p.m.: Congress banquet at Grosvenor House Hotel, Park Lane, W.1. Tickets price £1 10s. each.

Wednesday, June 10.—10 a.m. to 12.30 p.m.: Congress sessions. 2.30 p.m. to 6.30 p.m.: Visit to works of the British Oxygen Company, Limited, at Cricklewood, N.W.2, and Edmonton, N.18. Motor coaches leave Caxton Hall at 2.30 p.m.; or visit to works of another industrial firm (to be arranged). Motor coaches leave Caxton Hall at 2.30 p.m.

Thursday, June 11.—10 a.m. to 12.30 p.m.: Congress sessions. 2.30 p.m. to 4.30 p.m.: Congress sessions. 7 p.m. to midnight (approximately): River trip on the Thames. Motor coaches leave Caxton Hall at 7 p.m. Dinner provided on board ship. Tickets price 12s. each.

Friday, June 12.—10 a.m. to 12.30 p.m.: Congress sessions. 2.30 p.m. to 4.30 p.m.: Congress sessions. 6 p.m.: Visit to Aldershot Tattoo at invitation of the British Oxygen Company, Limited. Motor coaches leave Caxton Hall at 6 p.m. Dinner before and light supper after the Tattoo will be provided at Aldershot. Return to London approximately 2 a.m.

Saturday, June 13.—10 a.m.: Meeting of the Commission Permanente Internationale de l'Acétylène, de la Soudure Autogène et des Industries qui s'y Rattachent, at Caxton Hall, S.W.1. 11 a.m.: Closing session of Congress at Caxton Hall, S.W.1.

Executive Committee

The Executive Committee consists of Major C. P. N. Raikes, M.C. (chairman), Mr. V. A. Amodeo (joint general secretary), Mr. J. A. Drever, Mr. A. B. Harrower (joint general secretary), Mr. A. Hoddle, Mr. A. Stephenson, and Mr. L. J. Tibbenham. Biographical notes of the four principal officers are appended.

Dr. J. Donald Pollock, O.B.E., LL.D. (President)

Dr. Pollock is President-Elect of the British Acetylene Association. He succeeded the late Mr. K. S. Murray as chairman of the British Oxygen Company, Limited, on Mr. Murray's retirement in January, 1934. He has been long associated with numerous successful business enterprises in Scotland, notably as chairman of the board of Metal Industries, Limited, and Fife-Non-Ferrous, Limited. He joined the board of the British Oxygen Company, Limited, in 1932, when a merger took place between that company and Oxygen Industries, Limited, a company affiliated with Metal Industries, Limited, of which he was also chairman, to operate their oxygen interests.

In his early days, Dr. Pollock studied engineering in Glasgow, under the late Lord Kelvin, whose personal friendship he ever afterwards retained. In his medical career, Dr. Pollock held many responsible appointments, and on the outbreak of war he took a commission as Surgeon Commander in the Navy. In that capacity he was in medical charge of the naval operations in the warships engaged in patrol, scouting, minesweeping work, and all the naval defence works of that area. For these services he was awarded the O.B.E. (Naval) in recognition of his work. Since the war he has remained on the active list as Surgeon Commander in charge of medical services, R.N.V.R., for the East of Scotland.

Dr. Pollock holds the honorary degree of Doctor of Laws of Edinburgh University, is a member of the Court of that University and Assessor to the Lord Rector. He has had the high honour conferred upon him of being elected

Dr. J. Donald Pollock. Major C. P. N. Raikes.

a Member of the Senior Common Room of Balliol College, Oxford.

He is also one of the Trustees of the Carnegie Trust for the Universities of Scotland, and is on the Executive Committee of that Trust, having succeeded the Marquess of Linlithgow on his appointment as Viceroy of India.

In spite of his many business and academic interests, Dr. Pollock finds time to run a very successful training ship at Leith, at which during the past few years over 600 young men have received instruction in seamanship. Dr. Pollock has been twice round the world and visited most foreign countries in the course of his career.

Major C. P. N. Raikes, M.C. (Chairman of the Committee)

Major Raikes served for many years as a regular officer in the Royal Engineers, retiring in 1902 to devote himself to civil engineering.

Mr. V. A. Amodeo. Mr. A. B. Harrower.

He spent a long period in Canada, the United States, South America and Egypt, as a consulting engineer on hydro-electric work, which he abandoned to rejoin his old corps on the outbreak of war in 1914, throughout which he served, winning the Military Cross.

In 1919, he made his first direct contact with the oxy-acetylene industry, when he was appointed general manager of the newly formed Hydrogen, Oxygen & Plant Company, Limited, for which he erected oxygen plants in Admiralty dockyards at Portsmouth, Devonport and Rosyth. Following an agreement between his company and the British Oxygen Company in 1926, Major Raikes subsequently came into still closer touch with the industry, and when the Hydrogen Oxygen & Plant Company was taken over by the British Oxygen Company, Limited, in 1933, he was appointed overseas director in the latter company, a position he still holds. He joined the Council of the British Acetylene Association in 1927, and was President of the Association in 1934-1935. He is a member of the Commission Permanente Internationale de l'Acétylène, de la Soudure Autogène et des Industries qui s'y Rattachent.

Mr. V. A. Amodeo (Joint General Secretary)

Mr. Amodeo is managing director of the Acetylene and Welding Consulting Bureau, Limited, London, which he founded in 1930, and was recently appointed secretary of the British Acetylene Association. Mr. Amodeo was born in New Zealand, of British parents, and educated there. In 1900, after a period as English correspondent to a firm in Austria, he founded his own firm of British Coal and Machinery importers at Trieste. The company flourished and later established branches at Fiume, Venice, Genoa and in London.

During this period, Mr. Amodeo was responsible for the revival of the British Seamen's Home in Trieste, of which he was chairman and manager. In 1921, he founded the British Chamber of Commerce at Trieste of which he was chairman for many years, and in 1924, was elected President of the council of the British Chambers of Commerce in Italy, and during his year of office had the honour, among leading British residents in Italy, of presentation to the late King George V when his late Majesty visited Italy in that year.

Mr. Amodeo is very well known on the Continent of Europe as a "Cosmopolitan" in the best sense of the word, and is a fluent linguist in four languages.

Mr. A. B. Harrower (Joint General Secretary)

Mr. Harrower, who was educated at Oxford University and is a Barrister-at-law, first made contact with the oxy-acetylene industry in 1920 when he was placed in charge of the publicity and technical editorial work of Allen-Liversidge, Limited. Four years later, he was appointed to the assistant-editorship of "Industrial Gases" under the late Mr. K. S. Murray, then chairman and managing director of the British Oxygen Company, Limited.

On the amalgamation of Allen-Liversidge and the British Oxygen Company in 1930, Mr. Harrower was made publicity manager of the latter company, a position which he still holds, together with the editorship of "Industrial Gases." He was the author on behalf of the British Acetylene Association of "Oxy-Acetylene Welding and Cutting within the British Empire," a work presented at the Xth International Congress held at Zurich in 1930, and of a supplement thereto, presented at the XIth Congress held at Rome in 1934. He is a member of the Council of the British Acetylene Association and of the Commission Permanente Internationale de l'Acétylène, de la Soudure Autogène et des Industries qui s'y Rattachent.

He attended, as a representative of the Council of the British Acetylene Association, the annual Convention of the American International Acetylene Association, held at Cleveland, Ohio, in 1935, in order to extend a cordial invitation to American acetylenists to attend the International Congress in London this summer. Mr. Harrower is well known in oxy-acetylene circles on the European Continent and throughout the east and middle west of the United States of America. He held a temporary commission as Captain during the war in the Royal Army Service Corps and, during the last two years of the war, in the South Wales Borderers.

Some Special Test-Pieces for the Iron Foundry*

By L. G. GOUTTIER

(An Extract.)

By special test-pieces it is intended to signify not those which are generally included in national specifications, such as tensile, transverse, hardness, and the like, but those which are helpful in the conduct of one's foundry. A special test-piece should have, as its object, a supply of information as to the moulds and the materials from which they are constructed, as much as for the actual properties of the metal itself.

Some Well-Known Special Test-Pieces

First of all, there is the life test-piece, which takes the form of a spiral of triangular section, the length of which gives the measure of the aptitude of the metal under the conditions of the test to fill moulds and faithfully to reproduce therein its details. There are diverse variables which fundamentally differ but little. These have been treated from time to time in the technical Press.

Chill tests are also pretty well known, but, in this case, the forms adopted are very variable. Perhaps the simplest is a truncated cone of from 20 to 30 mm. dia. at its lower base, and 25 to

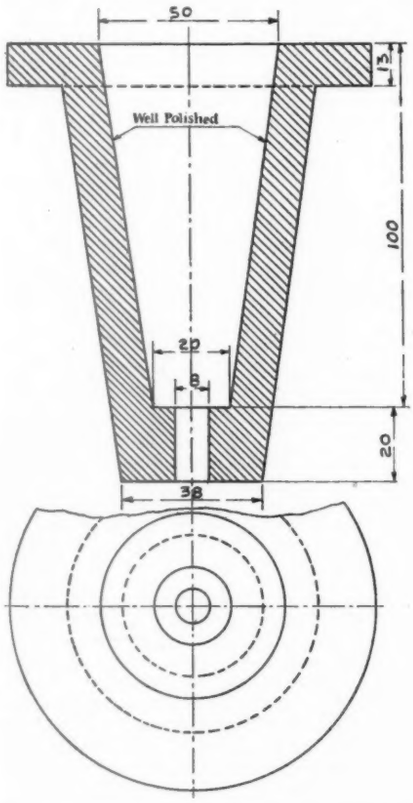


Fig. 2.—"Touch" Test-Piece (Sonnenfeld).

40 mm. at the upper surface, and from 150 to 200 mm. long, cast in a metallic mould. This shape is usually employed in the case of irons cast in a chill. The more or less mottled or even white appearance of the broken test-piece gives a good appreciation of its properties. Sometimes the form takes the shape of a rectangular plaque of 100 to 150 mm. square and 20 to 25 mm. thick, cast vertically in green sand, except that one of the small vertical faces of the mould is constituted by the face of a piece of iron buried in the sand. After breaking the test-piece across the chill face, the mottling and depth of chill are examined.

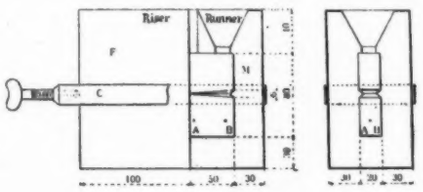


Fig. 1.—Chill Test.

M. Mould made from Silica Sand bonded with Linseed Oil. F. Machined Cast-Iron Block. C. Arrangement for Assembling the Block and Mould.

Again, sometimes the test is in the form of a wedge from 100 to 120 mm. long by 10 to 20 mm. thick on one side and 2 to 3 mm. on the opposite side, and cast vertically in green sand. One of the trapezoids faces downwards, the bottom of the mould being made from an iron plate. In breaking the test-piece perpendicularly to the quenched face in different places, one can postulate the depth of the chill at the various thicknesses. Of all these diverse shapes, used by many foundrymen, with a large number of variables, technicians in general prefer the stepped test-piece of uniform width, 20 mm. for example, made by successive sections, of which the thicknesses are the half, quarter and one-eighth of

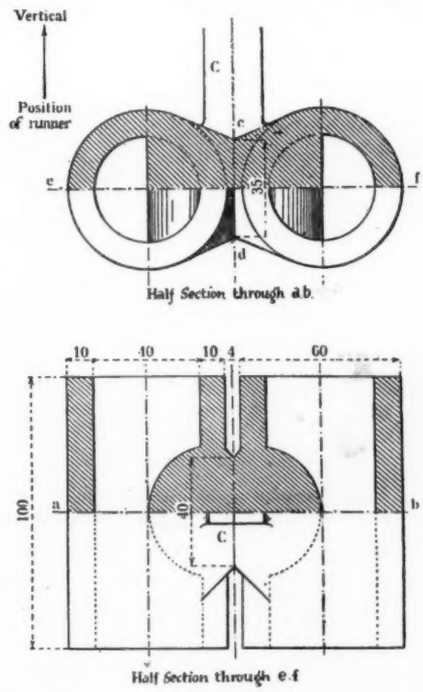
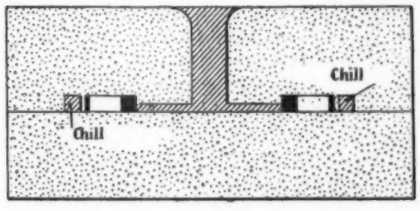


Fig. 3.—Porosity Test-Piece. After removing the Runner C, the Test-Piece is Fractured centrally through c—d.

the largest section. It is cast with one small face against a metallic chill face; quite often, it is chilled in oil or water, whilst it is still red-hot. This form is particularly suited to the study of the variations of hardness and the chill in varying sections, in relation to certain compositional variations. To these various forms of test-pieces, which have been well known for a number of years, it seems desirable to add that which has been developed by the Research Department of the Saulnes Blast Furnace Company, which was referred to by Mr. Guy Hénon at a recent conference in Charleville. This test is illustrated in Fig. 1. A machined iron chill, a mould made from silica sand bonded with oil, the separate runner and always maintained at room temperature, all these particulars are of such a nature as to fix, quite definitely, the conditions of the casting of various test-pieces, which is obviously very important for the true comparison of results.

A "Touch" Test-Piece

Whilst it can be granted that the examination of the fracture of the test-piece can never replace chemical analysis for a knowledge of the composition of the metal, foundrymen nevertheless never fail to draw some approximate indications. Knowing in advance the approximate carbon content, they deduct from the examination of the fracture of the chilled test-piece that the iron contains probably so much per cent. silicon; but after verification by chemical analysis very considerable differences will be found. The foundryman can give an approximation of 1.25 per cent. silicon, for example, and actually it will be 1.75. It is possible that the sulphur may be the element which can upset these estimations; but, if the manganese content is approximately constant, as is generally the case, there exists a simple means of obtaining by a special test-piece, an approximate indication of the sulphur content. This method, devised by J. Sonnenfeld,* consists of casting a truncated test-piece in a metallic mould, such as is shown in Fig. 2. The internal wall of this test-piece



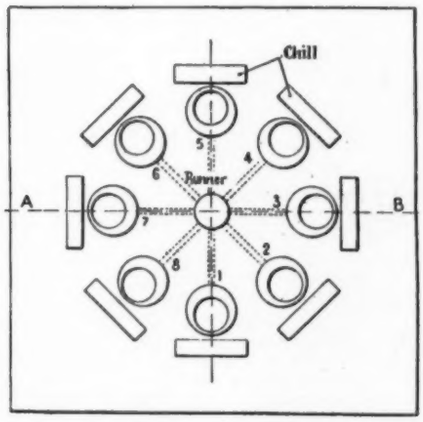


Fig. 4.—Test-Piece for Internal Tensions. Mould carrying Eight Test-Pieces for Ascertaining Internal Tensions, with or without Heat-Treatment.

* Translated from "La Revue de Fonderie Moderne."

* "The Foundry," December, 1935, p. 85.

is carefully polished. Up to 0.07 per cent. of sulphur, the surface of the test-piece is quite smooth; when the percentage increases, it becomes rougher and forms thousands of needle points; at 0.13 per cent. it is practically impossible to allow the finger tip to touch it; moreover, a careful examination discloses that there are very minute cracks. When the "touch" test-piece has this appearance the chill test will only indicate about 1 per cent. of silicon in an iron which, in reality, contains from 1.5 to 2 per cent.

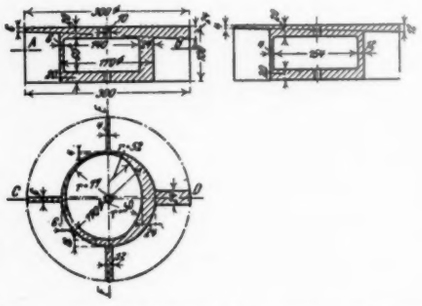


Fig. 5.—Raw Materials Test-Piece for Light Castings. Weight about 35 lbs. Internal and External Examinations of the Surfaces Provide Information as to the Refractoriness and Permeability of the Sand.

Porosity Test-Piece

At the same Convention, referred to above, Mr. Guy Hénon presented his audience with some photographs of porosity test-pieces. Since 1933 this test-piece was used continuously by the Rateau Company, to give some indication of the tendency in various irons to draw, generally caused by the oxidation of the metal and such a test is shown in Fig. 3. This consists of two thin hollow cylinders, arranged in parallel and joined at their centre by a large mass of metal, situated directly under the runner C. After cooling, the runner is broken and the test-piece is fractured along the line *c*, *d* between the two cylinders. A sound fracture, at this place, where the most favourable conditions exist for drawing, indicates, in no uncertain manner, that a non-oxidised iron, liable to give sound castings, has been used.

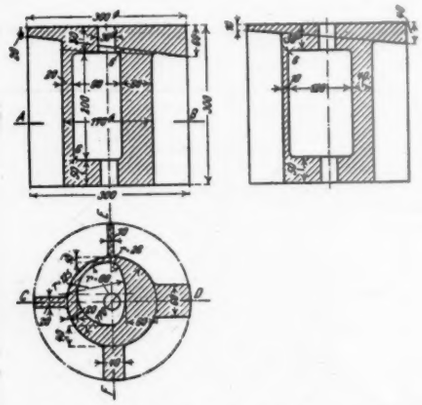


Fig. 6.—Raw Materials Test-Piece for Heavy Castings. Weight about 148 lbs. It is used in the same way as Fig. 5.

Test-Piece for Internal Stresses

According to their composition irons are, more or less, likely to contract when cooling in the moulds; this causes internal stresses which can bring about and introduce serious trouble. Under certain conditions they can add to the normal tensions of castings in service and bring about their fracture. They communicate to castings a tendency to deform whilst they are hot, which can be very serious if the castings concerned are for engineering jobs and have to conform to minimum tolerances. This tendency can be evaluated and measured, thanks to the use of test-pieces consisting of eccentric rings. Fig. 4 shows a mould for eight test-pieces of this type, cast together under identical conditions with chills in the neighbourhood of the thin part for the purpose of accentuating the internal stresses. Their dimensions are: exterior dia., 60 mm.; interior dia., 40 mm.; eccentricity, 6 mm.; height, 20 mm. After cooling, the test-piece is opened by a saw cut in the thick part on its plane of symmetry and the opening of the slit is measured. One can, obviously, obtain an approximate indication by measuring the width of the slit before the sawing is completed, and then afterwards. For greater precision, it is usual to provide, before sawing, on the outside, two faces parallel to the plane of symmetry, properly planed and adjusted, so that their movement before and after sawing can be measured.

Test-Pieces for Moulding Materials

Special test-pieces do not always serve for the purpose of examining the metal; they are sometimes used for the testing of the moulding materials, such as the moulding sand and core compounds and their behaviour in different parts of the moulds or cores. It is well known that the same materials do not suit equally for all thicknesses of iron section, but often the moulder varies the composition, according to judgment, without basing it on definite data, but rather on superficial experiment. A special form of test-piece has been got out by L. Treuheit, which is shown in Figs. 5 and 6. It includes a mass of metal in which a number of variable conditions are included. There are plain faces, curved faces, re-entrant angles and protuberances with variable progressing thicknesses between certain defined limits. Due to this diversity, Treuheit has been able to design two test-piece patterns, one for light castings of from 10 to 24 mm. thick and the other for heavy castings up to 60-mm. thickness. The test deals simultaneously with actual moulding materials and coremaking substances. In examining the test-pieces after cooling by breaking, in order to see the interior, the foundryman receives a rapid appreciation of the thickness limits for ascertaining whether the materials used are satisfactory. This test gives simultaneously some indication as to the worth of the moulding and coremaking materials at high temperature by an examination of the surfaces of the test-piece, and also as to their permeability to gases, by examination of the fractures of the test-piece in the places where gas has the greatest tendency to remain imprisoned in the metal.

Catalogue Received

Refractories. A complete range of monolithic and plastic refractory linings is described in full detail in a new brochure just received from General Refractories, Limited, of Sheffield and elsewhere. The range, which has been given the trade name of "Durax," is divided into three grades—a plastic firebrick composition; a refractory concrete, and a refractory cement, and each of these is given a separate treatment in the brochure. A small slip appears on page fifteen, where the word "refractability" is used instead of "refractoriness," the former word belonging to the technology of light rays. The booklet is full of really clear practical instructions and is well illustrated with convincing pictures. We believe that most foundrymen would learn much by a perusal of this catalogue and that it has a really useful place in their library of trade literature.

Students' Corner

SECOND SERIES

Cupola Practice

Q. 1.—*Which is considered to be the best cupola blower?*

A.—There are no standard types universally adopted by all makers of foundry blowers, hence it is impossible to specify the size, or design of a blower best adopted for, say, a 36 in. dia. cupola. Centrifugal blowers, positive pressure blowers, and fans are built along different lines, and are numbered according to different systems. The best procedure is to specify a machine that will deliver a given quantity of air in a given time, usually reckoned by the minute.

Some 30,000 cub. ft of air are required to melt 1 ton of iron, and a cupola should melt 10 lbs. of iron per hr. for every sq. in. of horizontal area at the melting zone. This is equivalent to 224 sq. in. per ton per hr.

From this can be determined how many cubic feet of air the cupola needs per hour to operate to capacity. Thus, a 36 inch diameter cupola has an area of $36 \times 36 \times 0.7854 = 1{,}017.87$ sq. in.; this multiplied by 10 gives 10,178 lbs. of iron per hr., or roughly 5 tons, and since it is necessary to supply 30,000 cub. ft. of air per ton of iron melted, a blower for a 36 in. dia. cupola will have to deliver $30{,}000 \times 5 = 150{,}000$ cub. ft. of air per hr., or 2,500 cub. ft. per min.

Volume of air and not pressure is required, and to obtain this with a small fan, extra speed is necessary. This may give rise to belt and pulley troubles, unless a direct motor driven fan is used. If a larger fan were used, it could be driven at a slower speed, with the same consumption of power, and still deliver the required volume of air at a suitable pressure, say, 8-10 ounces.

A fan for a 36 in. dia. cupola should have, (1) a 14 in. outlet, (2) blower speed of 2,300 r.p.m. and (3) a capacity of 2,650 cub. ft. per min. A blower with a 6 in. outlet would have to operate at 3,200 revs. per min. Air driven into a cupola under high pressure would exercise an oxidising effect on the iron. At the same time, there must be an adequate volume of air supplied, otherwise the pressure is dissipated when the air enters the cupola.

Q. 2.—*Is there any design of blast tuyeres that should be given preference?*

A.—Providing that the area of the tuyere is correct, it does not matter whether its shape be round, rectangular, oval or square. To reduce friction of the air, the tuyere whatever its shape, should have a slight spread into the wind belt, and a more liberal spread where it enters the cupola, *i.e.*, the tuyere should be bell-mouthed at either end.

Q. 3.—*How many tuyeres should be provided? What should be the size and position of each?*

A.—In general, a few large tuyeres are preferred to many small ones which destroy the volume. Examples of the number of tuyeres will be given later. As to the position of the tuyeres, they should always be clear of the tapping and slagging holes. The author is decidedly in favour of one row of fairly large tuyeres, divided according to the area, and the diameter of the cupola. The idea of three rows of tuyeres in graduated sizes was probably formulated upon a misconception of the position of the melting zone, which has definite limitations. Usually, a shallow fusion zone will give better and quicker melting. A reasonable depth for the melting zone would be about 12 in. In this case, the heated metal would drop through like a shower of rain, whereas with a deeper zone it would be slower in passing through, less fluid, and at a lower temperature.

(*To be continued*)

Modern Coreshop Production

By W. H. SMITH (Director, Foundry & Engineering Co. (West Bromwich), Ltd.)

(*Concluded from page 281.*)

Shop No. 4

In this coreshop (Fig. 6) there is a particularly clean lay-out, which gives a steady flow of production without any trace of being cramped at any point. The sand-mixing is done at the extreme end of the shop, dried sand from overhead storage hoppers being automatically measured and delivered into three mixers; core binders are also readily available overhead and are delivered by measure. As many as seven different grades of core-sand mixtures are used here, and these are delivered to core benches by barrow. The whole of the sand mixing and distribution is done by two men. The steel bands are kept fully loaded, and the two stoves shown in Fig. 6 are working up to full capacity. An additional unit has recently been added, which also discharges on to the same blacking band conveyor. Fig. 7 shows the end of the two stove units, where cores are unloaded after drying and cooling off.

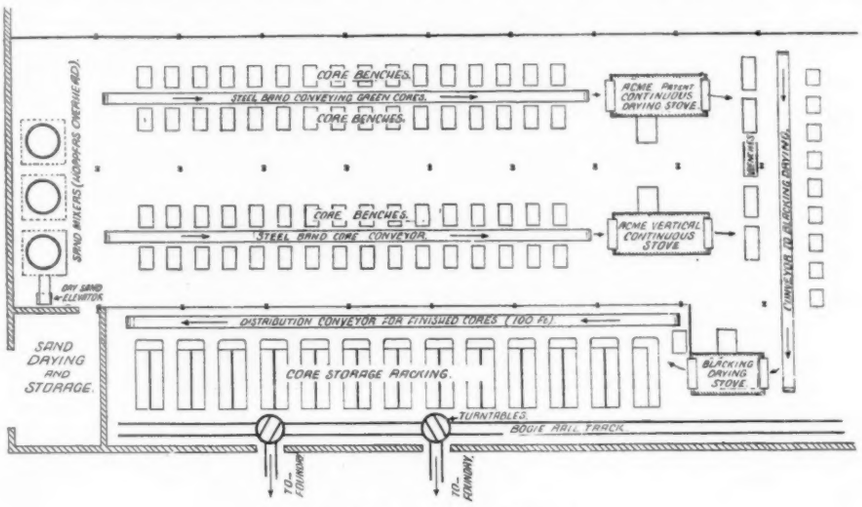


Fig. 6.—The Lay-out of Shop No. 4.

Some of the cores are gauged and dressed off at this stage, and any jointing is done on the benches shown, after which they are passed on to the blacking stage. Some are dipped before placing on the band conveyor, which passes at right angles to the drying stoves; others are brushed or sprayed on the small tables, or as they actually pass along the band. Next the cores are passed through a special continuous blacking drying stove (see the extreme left of Fig. 7) to ensure complete and uniform drying of all cores. They are subject to about 13 minutes' actual stoving and approximately 15 minutes' cooling before delivery into the core stores. Here a 100-ft. band conveys them to their proper section in the stores, where a final inspection and gauging is made before putting any core into stock. In this shop there is mechanisation without elaboration, and, considering the shop was not specially built for mechanising, and had to maintain full production whilst being changed over, the result is exceptionally good.

Shop No. 5.—Austin Motor Company, Limited

In the Austin plant mechanisation is in a very highly-developed form. The first impression one gets in seeing this coreshop is that of a complete maze of moving mechanism, but after following the whole arrangement through, step by step, most foundrymen could not do less than admire the successful way in which the Austin staff have overcome very serious difficulties and actually produced two or three cores in the space where only one could be made before. The position just over two years ago was that output had to be at least doubled in the shortest possible time, in a coreshop so positioned that it was impossible to extend on either side. To add to the difficulties, production had to be kept up whilst any reconstruction was carried through. These circumstances explain the logic of taking advantage of ample height in the shop for all auxiliary services, so as to leave the maximum floor space for coremaking and finishing.

The general lay-out is as follows:—The two grades of silica sand used are unloaded from trucks alongside the coreshop into vertical storage bins of about 500 tons capacity, and about 20 ft. high. Located between these, at floor level, is a rotary dryer through which the sand is passed, after which it is elevated to a rotary sand cooler placed on an upper floor built over a portion of the coreshop. This floor also carries the whole of the coresand-preparing plant, consisting of a Rotoil and two Pneulec mixers. The various coresand mixtures are set out separately on a board close to each machine, so there is no excuse for operators making mistakes in charging. Core-oil supplies are delivered by pipe line over the machines, and measured into each charge. The mixing period is checked by an ingenious timing gong which is set immediately the mixing is started, and rings as soon as the mixing time has elapsed.

Delivery of sand to the core benches is accomplished at a level below the sand-preparation floor, and above the coreshop floor, occupying neither upper-floor nor ground-floor space. At the rear of each coremaker's bench or machine is a small vertical hopper (Fig. 8), which receives sand supplies when required from a tilting-bucket-type conveyor system arranged to pass over every core bench. There are four or five different mixtures of sand used, and the buckets are numbered accordingly.

Each coremaker has a lever "trip" on top of his or her hopper, which is pulled over when sand supplies are required. This is arranged to tilt the first bucket containing the correct grade of sand passing over the hopper—all other buckets pass clear of the "trip." Small glass sight holes in the hoppers enable the coremaker to see both when the sand supply is deficient or ample. As regards the actual coremaking, this is done almost entirely by female labour, largely on turnover machines, although loose boxes are used for some jobs, and coreblowers of the Rocket pattern are also in use.

An unrehearsed time-production test was taken of one of the Rocket machines quite recently. The core was not a very simple one, and required just a little touching-up, but the two operators managed to average about one core per minute, which it is estimated would be one-

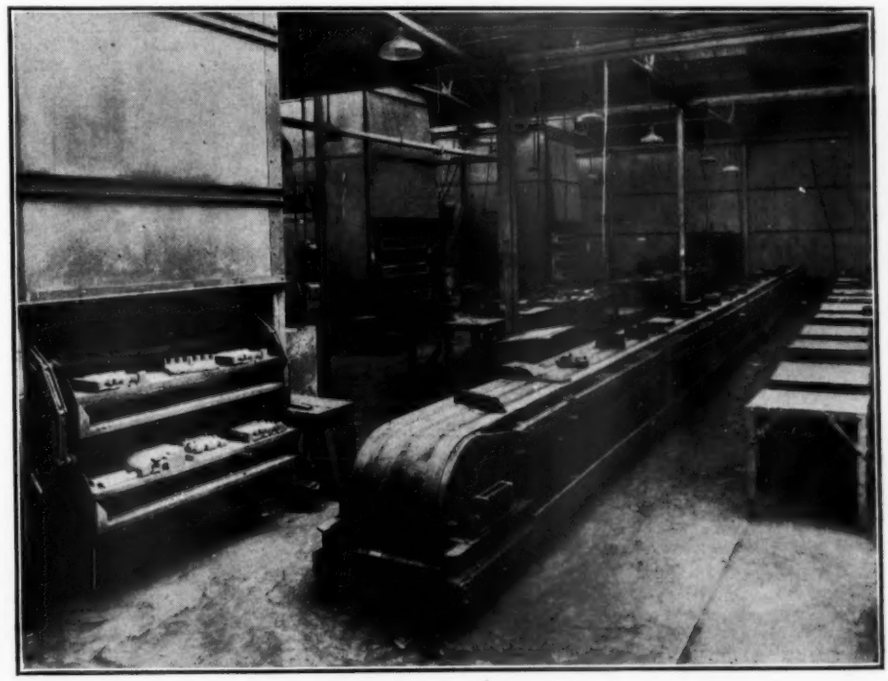


Fig. 7.—View in Coreshop No. 4.

fifth of the time required to make the same core on the bench.

It was surprising to note that some of the cores made by girls on turnover machines were very intricate, involving quite a number of hand operations, and taking 10 to 15 min. for a comparatively small core weighing perhaps 2 or 3 lbs.

An elaborate pendulum conveyor system, shown in Fig. 9, passes between all core-benches, across to the loading end of three large Acme continuous stoves, where cores are loaded

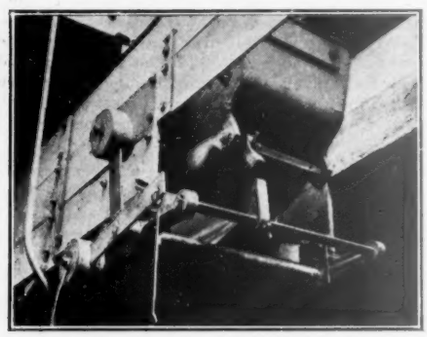


Fig. 8.—Tilting-Bucket Feed Arrangement used in the Austin Motor Coreshop.

on to the moving trays. Each of the three stoves has a different rate of traverse, and cores are loaded according to size and length of drying time required, so that maximum output is obtained. The pendulum conveyor system continues alongside the end stove, and across the back of the three stoves, where the dried and cooled-off cores are replaced on the pendulum for conveying through the processes of gauging and inspection, blacking, further drying-off, jointing and assembling into jigs ready for setting into moulds or delivery to the finished-core stores, from which they are taken by trucks to the mould-assembly line.

Shop No. 6.—Ruston & Hornsby, Lincoln

The next core-production department to be dealt with is in some respects the most interesting, on account of the very wide range of work which has to be handled. Ruston & Hornsby's Lincoln foundry is undoubtedly one of the best organised general foundries in the country, and maintains a large output of general engineering castings of high standard, ranging from a few pounds to 15 tons in weight. The coremaking for an output of this description presents many more problems than are encountered in shops handling all one type of work, and here the method adopted has been to divide the work into two sections. All cores within the size limits of the continuous drying stoves (5 ft. 6 in. by 20 in. by 20 in.) are produced in the mechanised coreshop (Fig. 10), and larger cores in a separate shop equipped with stationary-type stoves, bogie trucks, and overhead travelling crane, and specially organised to allow of the largest cores to be made by girl labour.

This is the only shop known to the author where really heavy cores are made exclusively by girls, but it has now been running quite a long time, and certainly works well. The overhead crane is kept fully employed, but this would be equally the case if men were making the cores, as most of them are too heavy for man-handling. Two labourers work in conjunction with the crane, manipulating the lifts, so that the girls have no heavier work than in other coreshops. Owing to the large size and varying shapes of boxes, and intermittent requirements, a shop of this kind cannot be set out in the same orderly fashion as a repetition coreshop on small work, and each coremaker occupies more floor space (Fig. 11).

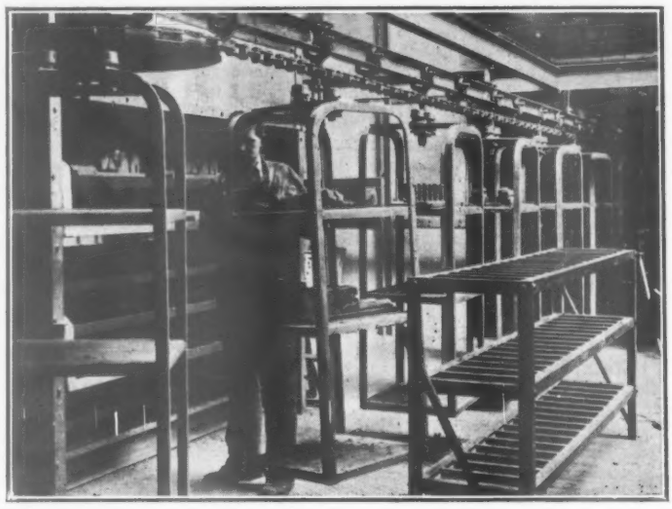


Fig. 9.—Pendulum Conveyor feeding the Austin Coreshop.

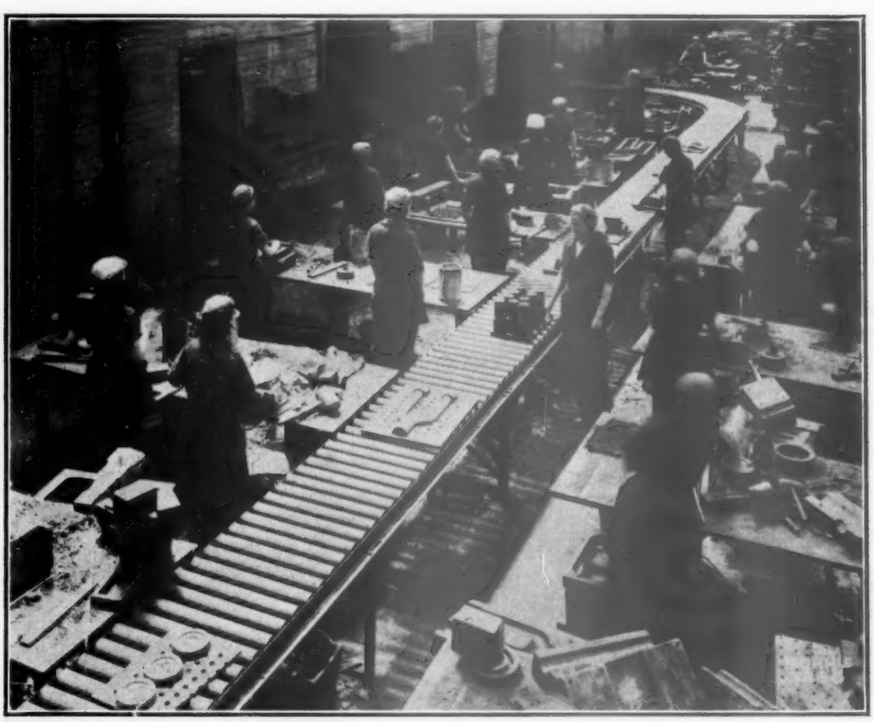


Fig. 10.—The Coreshop of Ruston & Hornsby, Limited.

Much the same conditions apply as in a large general moulding shop, where, of necessity, a number of large boxes in constant demand remain near the place where they have to be used, so that the minimum of time and expense is incurred to put them into use again when required.

Fig. 11.—Large Core made by Girl Labour.

The mechanised coremaking department deals with a large volume of cores in an endless variety of shapes and sizes. Fig. 10 gives a general view of the shop, and the specially-made roller conveyor which takes cores from the benches out into the adjoining main foundry building, where they are loaded on to the continuous drying stoves. It will be noticed that some of these are quite large cores, but the smallest are also dried simultaneously.

Owing to the increasing demands, this coreshop has had to be extended, and now also occupies a section immediately in front of the stoves, as seen in Fig. 12.

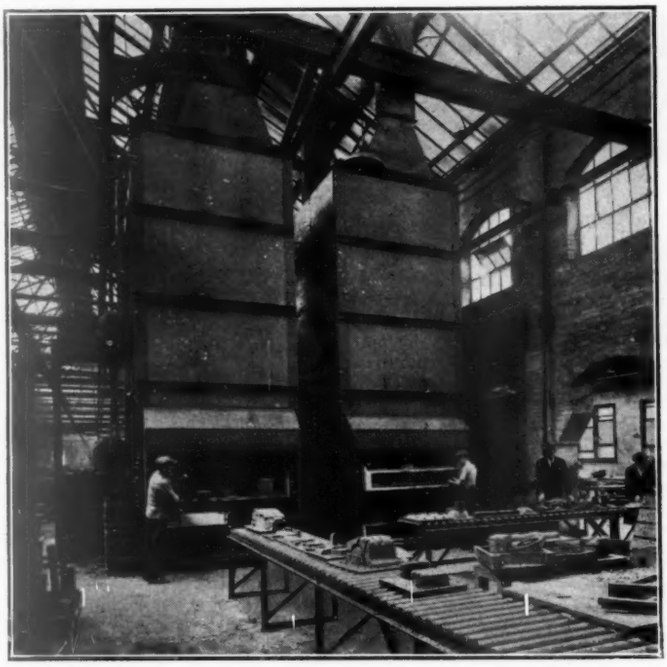


Fig. 12.—Drying Stove Plant installed at Ruston & Hornsby's Works.

After drying, the cores are unloaded on to another roller conveyor, Fig. 13, and from there to a traverser running on ground rails by means of which they are distributed to the girl dressers and blackers, being finally returned by another conveyor to the second blacking drying stove and dried for a short period at a temperature of 400 deg. Fah. They are afterwards finally inspected on the conveyor (shown in Fig. 13) before distribution to the foundry.

It is not possible to enter at any length into the question of cost figures. It may be of interest, however, in connection with this particular foundry, having literally thousands of coreboxes of all descriptions in use, to mention that a production time is fixed for every core, on a straight piecework system, and this applies to both light and heavy shops. To start such a system must have been a formidable task, but no doubt it contributes in no small measure to the high standard of output obtained.

Shop No. 7

The special feature of this coremaking lay-out is that it provides mass-production output with only one coreblowing machine and two operators. The author has already considered economy in floor space in other coreshops, but this occupies the least of all in relation to output, actually about 10 ft. by 7 ft., including the machine. It is made possible by the fact that although the number of different cores produced runs into hundreds, only one is in production at a time, and the mechanisation of coremaking and moulding is so perfectly linked up that on the average less than two hours elapse between the blowing of the core and knocking out the casting for which it is used. This particular machine is producing 240 plates of cores per hr., and is the fastest of any so far examined.

A general lay-out of the linking-up of the core production with the plant as a whole may be gathered from the rough diagram, Fig. 14.

The sand is unloaded from railway trucks and elevated on to an overhead stage where it is mixed, and delivered to the coreblowing machine underneath by means of a hopper. Two operators work the blowing machine, turn out the cores on to the bench, from which they are

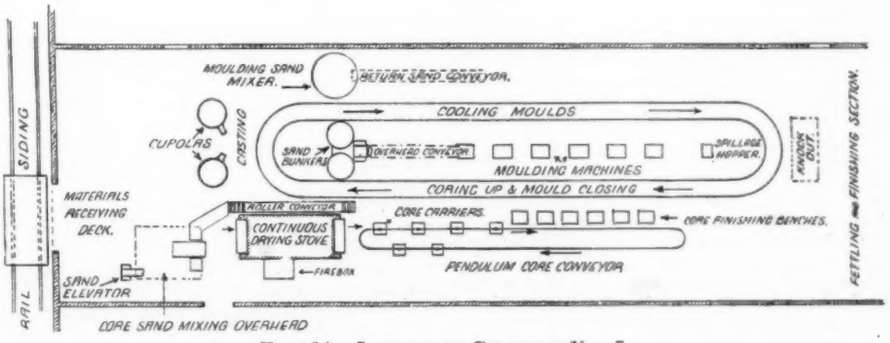


Fig. 14.—Lay-out of Coreshop No. 7.

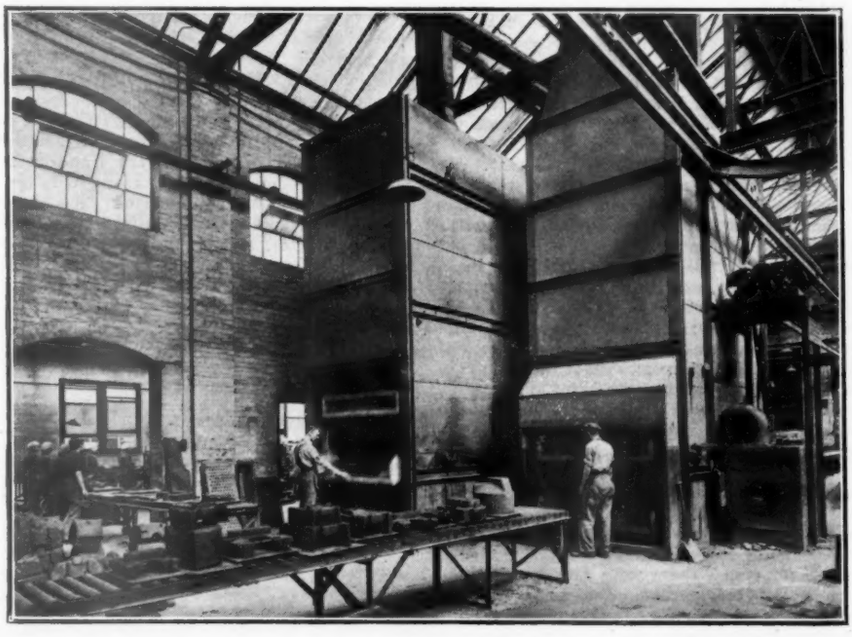


Fig. 13.—Cores leaving the Stoves are inspected and delivered to the Foundry by Roller Conveyor.

handed direct on to the Acme continuous-drying and cooling-off stove. At the other end the cores are unloaded on to a pendulum-type conveyor, the plates being returned to the bench by gravity rollers. Cores are delivered opposite to the position where required for placing in the moulds, and after finishing up on small benches, are placed in the moulds by a corer who walks on the casting platform as it travels along.

The impression one gets from a plant of this type is the utter hopelessness of the old-fashioned methods in competition with production on these lines.

There are several other shops which might have been described if time permitted, but those considered all operate under different circumstances, and no two have been "modernised" on exactly similar lines, yet it might be fairly said that each quite successfully meets the particular requirements for which it was laid out.

In conclusion, the author would like gratefully to acknowledge the courtesy of all those firms which have permitted him to describe their plants, and members of their staffs for assistance given. Also to Mr. F. J. Cook and Mr. W. G. Morgan for loan of certain lantern slides, and those firms whose specialities have been exhibited, and to the lantern operator. Special thanks are due to Mr. Timmins (the honorary secretary of the Branch) for assistance in getting new slides.

Birmingham and West Midlands Progress

NEW BRANCH-PRESIDENT AND INCREASED MEMBERSHIP

Mr. G. W. Brown (foundry manager, Austin Motor Company, Limited) was elected President of the Birmingham, Coventry and West Midland Branch of the Institute of British Foundrymen at the annual meeting of the Branch, held at the James Watt Memorial Hall on April 3. Mr. G. M. Callaghan (retiring President) said he had much pleasure in proposing Mr. Brown, as he had gone through both the Junior and Senior Vice-Presidents' offices, and had been of very great assistance to him during the past year. He had seen a great deal of Mr. Brown in the last two years, and had formed a very high opinion of his capabilities, level headedness and interest in the Institute; and he felt sure that they could not do better than elect him as their President for the coming year. Mr. F. J. Cook, in seconding, said the Branch had been very fortunate in recent years in having men who were loyal workers for the Institute, and who by their keenness were able to attract members to their meetings as well as to give Papers for discussion. In Mr. Brown the Branch was also fortunate, for he was an exceptional member, inasmuch as he happened to be not only a foundryman, but an engineer. When one considered the strides which engineers were making in the improvement of foundries, it could not but redound to the good of the Institute, and the Branch in particular, to have a man like Mr. Brown at their head. Under his presidency they could look forward to a very successful and happy year.

Mr. Callaghan then invited Mr. Brown to take the chair, and, in congratulating him, hoped he would have a successful year. He appreciated the help from the Council and members which he had received, and he had enjoyed the opportunities which had been afforded him of meeting the foundrymen in the district.

In acknowledgment, Mr. Brown said he appreciated the great honour conferred upon him. Although he did not take second place to anyone in his admiration of the foundry world at large, he thought the technique and the mentality required to make up a successful foundry executive were of no mean order, and his admiration was unbounded for the men who filled those positions so capably. He was sure that the Council would be glad to receive whatever criticisms they had to offer as well as their help, and he, personally, should appreciate both, because useful criticism and assistance was the soundest way by which they could make progress.

A Report on Progress

Presenting the Annual Report, Mr. A. A. Timmins (hon. secretary) said the attendances at the seven Branch meetings (one at Coventry) showed a slight improvement over last year, the average being 53 against 50. A record attendance of 84 was obtained at the lecture on "Modern Coreshop Production," by Mr. W. H. Smith. The standard of the Papers had been high, and very good discussions have followed all of them. At the opening meeting in October, a presentation was made to Mr. L. W. Bolton in recognition of his assistance to the Branch during his five years' service in a secretarial capacity. A diploma was also presented to Mr. W. H. Bamford for his Paper on "Cupola Practice with a View to Closer Carbon Control"; this Paper had been published in this year's "Proceedings" of the Institute. In January a joint meeting was held with the Electrodepositors' Technical Society, when a Paper was read on "Troubles Experienced in Electrodeposition Due to Unsuitable Castings"; some 30 members attended and a lively discussion ensued.

Two works visits had been made. One party of 45 members visited the steelworks of F. H. Lloyd & Company, at Wednesbury, while 32 members visited the foundries of Daimler, Limited, at Coventry. The recent annual dinner and dance was very well attended and highly successful. The Council was pleased to report that no financial loss was incurred.

The Branch syllabus was again issued in the form of a diary. A slight improvement was made by stamping each diary with members' initials, an innovation which was appreciated.

There has been a satisfactory improvement in the membership, 25 new members having been elected and seven transferred from other Branches; six members had either resigned or lapsed. The total membership stood at 265, showing an increase of 25 over last year. This increase entitled the Branch under the new bye-laws to elect a further representative to General Council (making three in all).

In a very successful year financially, the subscription income was £358 17s. 6d., this being the highest ever recorded. The credit balance was £28 6s. 6d. as against £31 6s. 6d. last year. Income, however, had been less—£92 10s. as against £100 last year.

The Secretary reminded the Branch that, although the membership was increasing, the present roll call of 265 was not nearly representative of the foundry industry in the Midlands. To his mind, membership of the Institute provided the spice to a foundry training. It combined all the advantages of a technical institution with those of a social club, enabling members to discuss technical subjects and at the same time meet each other in a friendly and social fashion.

In conclusion, Mr. Timmins thanked members of the Council, and in particular Mr. Callaghan and Mr. Bolton, for the help and assistance they had given him in his first year as secretary.

Mr. W. G. Morgan moved the adoption of the report and accounts and coupled with it congratulations to the Secretary on his efforts this past year. Mr. J. Dixon seconded, and the motion was carried.

Other Branch Officers

As senior Vice-President, the Chairman proposed Mr. H. J. Roe, and said that no one connected with the Institute knew more of the details of its organisation. He had been a tower of strength to the Council, and was most competent to advise on affairs in general. Mr. G. R. Shotton seconded. Mr. E. J. Lewis then proposed Mr. W. J. Molineux as junior Vice-President, and said that he was a practical man who had had a wide experience of Branch Council work and was a regular attendant thereat. Mr. A. Tipper, in seconding, considered that Mr. Molineux was a good selection, and he should be of great help to the Branch. Both nominations were cordially confirmed.

Mr. Callaghan then moved that Mr. Timmins be re-elected hon. secretary and treasurer, and remarking that it was a somewhat onerous office, said they had been fortunate in having three successive secretaries who could spare the time for the job. The Chairman said it was only right that he should second, because Mr. Callaghan and himself had seen a good deal of Mr. Timmins and knew how well he had managed. He thought they would agree that the admirable report which he had presented had impressed itself on their minds. Being unanimously re-elected, Mr. Timmins acknowledged the support he had received, especially at the dinner.

There were three vacancies on the Branch Council, for which there were four nominations. On a ballot being taken the following were elected: Mr. E. W. Wynn, Mr. G. R. Shotton and Mr. J. J. Sheehan. The Chairman said it was desirable to compel a ballot, because it enabled members to express their interest in the management of the Branch.

Mr. G. T. Lunt and Mr. W. G. Morgan had been nominated as Branch delegates to the General Council, and as a third was now required, those members with Mr. H. J. Roe were appointed on a ballot. Mr. Callaghan feared that after a year as President he could not find the time to serve. Mr. J. W. Gardom, who proposed Mr. Roe, mentioned that the President and secretary were *ex-officio* members of the General Council, and explained that there had been a recommendation that the senior Vice-President should serve also.

As delegates on the Technical Council Mr. L. W. Bolton and Mr. G. R. Shotton were chosen, Mr. Roe stating that both served on important committees, while Mr. Timmins, in seconding, said that both nominees were able technical members who would render good service.

Earlier, Mr. F. J. Cook moved a vote of thanks to the retiring officers—the President, Vice-Presidents, and also the Dinner Committee, who carried through very successfully the recent social function. The Branch had experienced an enjoyable and profitable year, he added. Mr. E. W. Wynn seconded, and particularly mentioned Mr. Callaghan, who had fulfilled his duties quite as well as he carried out his duties in every-day life. Mr. Timmins had also tackled his job very capably, and deserved their thanks for maintaining the good work of his two able predecessors. Mr. Callaghan acknowledged the compliment on behalf of his fellow officers and himself.

Pyrometry

At a meeting of the Associate Section of the Staffordshire Iron and Steel Institute, held on March 25, Mr. A. Mould read a Paper on "Pyrometry," in the course of which he traced the history of heat measurement from the first thermoscope, said to have been made by some Greek physician in 2 B.C. With regard to modern appliances, the author mentioned the iron-constantan and chrome-alumel, which were base-metal couples, and could be used continuously up to 600 deg. C. and 950 deg. C. respectively. Intermittently, they could be used up to 700 deg. C. and 1,050 deg. C. respectively.

A new couple of non-metallic type, not yet used to any great extent, was the silicon-carbide/carbon couple for temperatures up to at least 1,800 deg. C. It consisted of a tube of compressed carbon with a rod of silicon carbide down the centre. The two were joined at the hot-junction end, and insulated at the other end by means of a refractory ring. The thermo-electric power of this couple was approximately 30 times that of the platinum/platinum-rhodium couple, and five times as great as the iron-constantan couple. The advantages of using this type of couple were that high internal resistance galvanometers could be used. Carbon/silicon-carbide was very stable, and the maximum temperature to which these couples might be subjected was about 2,700 deg. C., the melting point of silicon carbide.

The author concluded his Paper with a section on radiation pyrometers.

Expansion During Martensitisation

The effects of special elements on the velocity of expansion due to martensitisation during quenching of steel have been investigated by T. Murakami and A. Hatta, according to a Paper in Tetsu-to-Hagane. An automatic recording apparatus for the expansion-time curve during quenching was constructed, and data for four carbon steels and 32 steels containing less than 2 per cent. of Mn, Ni, Co, V, Cr, Si, W, or Mo, with approximately eutectoid carbon content, were recorded. The quenching temperature was 850-1,100 deg., the medium being oil. It was observed that the temperature of commencement of martensitisation generally fell as the quenching temperature was raised.

The Control of Foundry Labour*

By J. LAING

In order profitably to direct all sections of foundry workers it is essential to know thoroughly the practical side of the business and also have a good knowledge of the metallurgical principles involved. Also because between 100 and 200 tons of material have generally to be handled to produce one ton of finished castings—although the full significance of this is not often appreciated—it is recognised that organising ability is also essential. The importance, however, of what may be termed the abstract side of foundry management is not so generally recognised, and it is of this side that it is proposed to make the subject of this short Paper.

First in importance comes a knowledge of men, and one's own men in particular. By this is meant a knowledge of the reactions towards such things as reward, pride of achievement, leadership, desire to copy, and ambition, and how these qualities are affected by interest, fatigue, temperament, fear, envy, and shop conditions.

With direct systems of piecework, "reward" plays a very important part in production speeds, and generally speaking if this is not considered adequate by the recipient, one does not get the best effort. It is, however, because the possibilities of reward can be so much affected by a man's outlook towards his job that these things become so important.

There is of course a very small minority of workers who appear to be always satisfied provided they earn a little over their flat rate. A shop full of men of this type would be a hopeless proposition, but in general foundries one or two can be usefully employed for making those occasional odd jobs, which have often been priced for batch production, and which so exasperate a fast man.

Fatigue Reduction

Interest is of prime importance because if one can maintain interest one has gone a long way towards preventing fatigue. There are many ways by which interest can be maintained even on the plainest work, and the following are a few suggestions which may be useful:—To examine the castings casually as they are knocked out, and also after trimming; to comment to the moulder occasionally on their appearance; to make an examination of the pattern and if quantities are required from it, to return it to the pattern-shop for a coat of varnish may help; to give additional assistance in respect to unskilled labour which is usually very much appreciated on this class of work. In other words the suggestions put forward are intended to indicate that if the manager takes an interest in the plain, as well as the more complicated castings, he will stimulate the interest of the operator.

A study of the cycle of operations when dealing with medium and large work will reveal that production speeds tend to decrease when each operation is unduly long. The cause of this is again mainly due to fatigue, and the remedy is based on the old adage which says "a change of occupation is sometimes as good as a complete rest." For instance, on a very large job the time taken to put in an individual ram round the pattern may be considerable; but the placing of an extra man, or extra men as the case may be, on the job, causes the work cycle to occur more frequently. Then as each operation such as ramming, venting, ironing, or filling in sand, brings into use different muscles a reasonably frequent change is obtainable which is almost as good as a rest.

On the other hand it is even more important not to "over-man" the job and so make each operation too short, as in this manner valuable time will be lost through unnecessary changeover.

Idiosyncrasies

A knowledge of one's own men is specially desirable when placing them to work in gangs, or even in pairs. Some men are always content to leave as much as possible to the other man, believing that when working under these conditions they are relieved of all responsibility. Others are not happy unless they are leading with their section of the work. Then there are some who are not quite sure of themselves and prefer to be behind a leader, yet will strive hard to keep near him. Some men by their very nature must take charge of the job, and production is definitely prejudiced by placing two such men to work together for long periods. Instances are known where two men when put together on one job would invariably quarrel over some particular operation, and then both would work furiously for several days without speaking to each other. This, however, is a rare occurrence, and the ideal combination is the quick man who knows his job and eager to take the responsibility, with the honest worker who does not intend to be left far behind.

Although much has been written about "shop conditions" their effect on fatigue and consequently on production is not yet fully appreciated. North lighting, with its freedom from sunshine and shadows, and good ventilation, are invaluable if really hard work is to be carried out to the best advantage, in the summer time. When they are not available the men tire more quickly, which results in unduly prolonged rest periods. It must be remembered that ramming, or throwing up sand, in an unsuitable atmosphere is very different from walking round the foundry.

Taking the other extreme, winter time is, of course, more conducive to higher speeds on the more laborious operations; but on intricate work there may be long periods of comparative inactivity; and on almost all classes of small hand work the operations change so frequently that it is impossible to keep even comfortably warm however hard a man may work, if the temperature is round about freezing point. Under such conditions as these, production suffers even more than it does on the hottest of summer days.

No doubt conditions are still a long way off the time when air-conditioning will be applied to all foundries. But it is suggested to those interested in shops where the temperature frequently falls very low, the serious consideration of some form of heating other than by open fires.

Ambitious Workers

Ambition as generally understood is not always a productive agent. Indeed, it is often the reverse, because all men cannot succeed, and thwarted ambition often leads to dissatisfaction and indifferent workmanship. Many—although of course not all really good fast men—have no desire to be anything other in the foundry industry except moulders. At the same time all good men have had a definite desire to take full advantage of the practical facilities for learning open to them, during some part of their early life. Even if they have had no inclination to become foremen or managers, they did at any rate intend to be leading lights in their own sphere.

A desire to prove oneself as good as the next man is latent in most men, and a little incident which usually took place on Saturday mornings in a certain foundry many years ago is worth recalling. After receiving his pay on Friday evenings, one of the bench moulders employed by a firm seldom went home before closing time, with the result that on the following morning he was not in a very fit state for hard work. He did not wish, however, to appear slower than the next man, so on these occasions when he fell behind with his work, he would quietly remove one or two moulds from his neighbour's row to his own. The neighbour evidently had a very amiable disposition, as he never commented on the occurrence, but simply re-doubled his efforts to make up the loss.

This was rather a unique way in which production was made good, but whether the stealing of the moulds was prompted by envy, pride of achievement, or ambition will never be known, but it certainly was not due to fear.

Moulding Machines

This little story suggests that some of the machine moulding salesmen might make more use of example. They should be prepared to take along a really practical expert, to see the type of work a prospective customer has to produce, and to give him an approximate statement of the output likely to be obtained on such work under the existing shop conditions. In the event of a sale the demonstrator could then be loaned to the purchasing foundry for a day, or two days if necessary. By this means the men in the shop who would later have to work the machines would be given an example of the maximum production that was to be expected under the given conditions. Under these circumstances there would be fewer dissatisfied customers and more business would accrue.

Fear of making mistakes may also play a part in retarding production, because it is not (other things being equal) the amount of work a man puts into his job that gives quick production, but rather where a moulder knows how much he can safely leave out. It will be found that nervousness may affect any employee, from the apprentice to the oldest moulder, and even the shop foreman. It generally enters into play after a man has made a scrap casting, and quite good moulders are known to have been so much affected after making one, or possibly two wasters, that it could only have been by sheer luck that they could have produced a good casting.

In cases of this nature it is necessary in some way or another to remove the cause of the unrest, in order to bring the risk down to the normal 2, 3, or 4 per cent., as the case may be. The best way to accomplish this is to have a short general talk on the subject with the man concerned, and to direct a few of the major operations with that supremely confident air of the specialist, and at all times to avoid the manner of the country practitioner who is never quite sure whether it is going to be measles, chicken-pox, or tonsilitis.

DISCUSSION

The Branch-President (Mr. F. O. Blackwell) said it was obvious that the Paper had been written by an author having a very human understanding of the point of view of the workers, and he congratulated Mr. Laing upon a very thoughtful and practical Paper.

Mr. H. W. Lockwood (Branch Hon. Secretary) asked if the author would elaborate his point that between 100 and 200 tons of material had to be handled and/or used in the production of one ton of finished castings.

Mr. J. Laing replied that he included in the weight of from 100 to 200 tons all the material that was moved on the foundry floor from the commencement of the operation of the making of a casting until the casting was finally delivered. He had taken into account the number of times the sand, the moulding boxes, lifters and other apparatus, and the metal, had to be moved, bearing in mind that some of the materials and apparatus had to be handled many times in the course of the operation of producing castings. Sometimes the total weight of

* Prize-winning entry to the London Branch Short Paper Competition.

material handled, when calculated in that way, amounted to more than 200 tons per ton of finished castings. It depended largely, of course, on the class of work and the particular shop in which it was carried out.

Mr. H. O. Slater (Past Branch-President) said the Paper had recalled to his mind a slogan which had been used by Mr. Feasey (to whom he was apprenticed)—"Manage your men and you can manage your metal." The Paper also served to emphasise very strongly the necessity for continuity of employment and the necessity for taking due notice of the temperaments of the men; that was one of the greatest secrets of the success of any foreman or manager.

Demand for Skilled Moulders

Mr. G. C. Pierce (Past Branch-President), in a compliment to the author, said he had perceived throughout the reading of the Paper that it had been written by one who was a keen student of the psychology of the moulder, and who knew what he was talking about. It was necessary, however, to use a fair amount of tact in order to get the best from the men. The problem of the psychology of the foundry worker was very deep, and it was evident that Mr. Laing did really know the foundry worker.

Mr. Pierce refuted the suggestion that, by reason of the mechanisation of foundries, there was a great danger of craftsmen being eliminated, and he asked for Mr. Laing's views on the matter. He ventured to assert that just as many highly skilled moulders were required in a period of normal trade nowadays as had been required in any other normal trade period in the past. Nowadays the industry was suffering from a shortage of skilled moulders in some parts of the country, and that was being realised by those responsible for the production of castings—he did not mean those who merely wrote orders on paper, but those who were actually responsible for the production of castings in the foundry. He attributed that shortage to the fact that mechanisation of foundries had brought in its train a greater demand for skilled men.

Mr. Laing did not think there was a greater demand for skilled men to-day than in the past, relative to the tonnage produced in this country; indeed, he believed that relatively there was a less demand for skilled men nowadays than formerly. At the same time, the demand for highly-skilled men to-day had become greater than the supply. Many circumstances had led to the making of quite a number of moulders with doubtful ability, due to no fault of their own. The particular conditions of the last ten years or more had not tended to make really good moulders, but the services of the boys who were apprenticed at the present time were likely to be in demand for a good number of years to come, at any rate, during normal trade periods. There would always be a demand for skilled men in the industry, but he did not think there would ever be quite the same demand for the skilled man as in the past, for the same relative quantity of castings produced.

Mr. V. Delport (newly-elected Branch-President) suggested it might meet Mr. Pierce's point to say that skilled men were still required in spite of the mechanisation of foundries, but that the kind of skill required was not the same as that required formerly.

Mr. Pierce said he adhered to his statement exactly as he put it.

Royal Patronage

His Majesty King Edward VIII has been graciously pleased to grant his Patronage to the Iron and Steel Institute. It may be recalled that the Institute was similarly honoured by the late King George V and by King Edward VII before him, both of whom had previously shown their interest in the Institute's activities by consenting to accept Honorary Membership. His Majesty King Edward VIII was also an Honorary Member until his accession to the throne.

West Yorkshire Foundrymen's Annual Meeting

MR. J. HEPWORTH, M.P., ELECTED BRANCH-PRESIDENT

The annual general meeting of the West Yorkshire Branch of the Institute of British Foundrymen was held on April 4 at Bradford Technical College, under the chairmanship of Mr. F. K. Neath, B.Sc. The date of the meeting, for reasons of convenience, has been transposed from April 25. Usually the annual meeting concludes the session, but this year the final meeting, held on that date, will be devoted to a technical address and discussion, originally planned for April 4.

Mr. S. W. Wise, submitting his annual report as hon. secretary, said the work of the 1935-36 session was likely, he believed, to prove of outstanding importance so far as concerned the future prospects of the Branch. The session had been opened by an unusually thoughtful Presidential Address by Mr. Neath, followed by a lecture by Mr. Makemson (the Institute's Secretary), who presented a very clear view of the extent of the influence and interest of the Institute. During a visit to the works of David Brown & Sons, of Huddersfield, the members were hospitably entertained by the firm and were given opportunity of seeing the method recently adopted by that famous company of using material for moulding purposes not common in British foundries. Another interesting visit was to the works of Wm. Asquith, Limited, of Halifax. The amount of interest taken in discussion raised by Mr. H. Forrest—Branch Vice-President—on cupola practice indicated that there were still ample channels to be explored in connection with that much debated subject.

A really serious attempt was being made to place methods of foundry costing on a standard and uniform basis, and the Address given to the Branch by Mr. Hodson, a member of the Institute's Costings Sub-Committee, gave rise to a lively discussion whilst showing clearly the many difficulties of the task undertaken by that Committee.

The annual dinner (proceeded the secretary) was, as always, a thoroughly enjoyable function, and was, he felt, now accepted as a permanent feature of their winter programme. It provided, in his opinion, a much-needed opportunity for social relaxation. The dinner had been attended by the President and members of the Council of the Institute and it was perhaps opportune to mention that the General Council was again to visit the West Yorkshire Branch in January next and he felt efforts should be made to make the occasion worthy of the Branch. The present healthy and stable outlook for the industry in which members of the Branch were interested was to some extent being reflected in their own particular sphere. The Branch membership, which had remained steady during the lean industrial years through which they had been passing, had now taken an upward trend and although it was yet too early to predict results, there was every reason to believe that the work of the organisation was attracting attention. It was still earnestly to be wished that a larger proportion of foundry firms' principals would be in evidence in the Branch activities.

Hitherto the thought had been current in the Branch that the possibility of the Institute's national conference being held in the West Riding was outside the range of practical politics. There were, however, signs and indications that in the not very distant future they may have reason to think otherwise; and should such an occasion arise they must prepare to make it one of the outstanding events in the history of the Institute. Mr. Wise, in conclusion, thanked his fellow officers and members for kindly help and friendliness during the year's working.

The report was adopted—with thanks to the Secretary—on the motion of Mr. H. A. McColl (head of the Metallurgical Department at Bradford Technical College), seconded by Mr. A. W. Walker (Past-President).

Election of New Officers

The following officers were elected for the coming year:—

President, Mr. Joseph Hepworth, J.P., M.P. (East Bradford), consulting engineer. *Vice-Presidents*, Mr. H. Forrest (Stanningley) and Mr. S. Carter (Huddersfield); *Hon. Secretary* (re-elected), Mr. S. W. Wise (Bradford); *Added to Branch Council*, Messrs. H. A. McColl (Bradford Technical College), W. Fearnside (Keighley) and A. Kent—the latter newly transferred from the Lancashire branch. Messrs. Riley and McColl were appointed Hon. Auditors; Messrs. H. Bradbury and F. Squires (Hon. Registrars and Librarians; Messrs. A. S. Worcester and W. G. Thornton (Bradford) both Past-Presidents of the Branch—as delegates to the Institute's General Council; and Messrs. A. S. Worcester and F. K. Neath, members of the Institute's Technical Committee.

The Institute and Foundry Progress

Mr. J. Hepworth, M.P., in thanking the members for his election to the chairmanship of the Branch, said he considered it an honour and also a considerable responsibility. During the past thirty years or so great progress had been made in the foundry industry, and it was only by meetings and discussions that members of the industry were able to pass on their experiences and exchange ideas in the general movement towards further enlightenment. He was afraid it had to be admitted that when he (Mr. Hepworth) was a youth, hardly one in a hundred among average foundrymen had any precise knowledge on subjects of foundry practice. It was simply a matter of so much iron and so much scrap. Since that time there had been marked progress not only among leaders of the industry, among the people of research, but among the rank and file engaged in every-day work in the foundry, and it was for the Institute to see that this progress was maintained.

Mr. Hepworth said he felt it was true to feel that this country, provided the prevalent international unrest did not lead to war, was in for a steady improvement in the engineering and allied industries. The spending of three hundred millions sterling, which the Government now contemplated, even though it was in a sense on warlike materials, would inevitably have a good effect on the engineering and foundry, as well as other, industries. It might be remarked that spending that amount of State money on armaments was going to remove any chance of reduced taxation. He was afraid that might be true. Taxation played a great part in the success or otherwise of industry. The lower the taxation the better chance there was for trade recovery. But if circumstances were such that the prospects of reduced taxation in the near future were rather small, it was at any rate something to feel that the vast amount of money to be spent would help employment and industry and to a large extent counteract the deprivation of tax benefits for which they had all so much hoped.

Speaking subsequently, in moving a vote of thanks to retiring officers of the Branch, Mr. Hepworth said he would like to see the Institute of British Foundrymen placed on a more scholastic basis than at present. He realised what valuable work the Institute was doing, both in research and education, but he felt it would be a fine thing if young men coming into that important part of the engineering industry—and it was an important part, when they thought how much all branches of engineering depended on good work in the foundry—could come into it

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American Foundrymen's Association

ANNUAL CONVENTION IN DETROIT

The 1936 annual convention of the American Foundrymen's Association will be held in Convention Hall, Detroit, from May 4 to 9. In connection with the convention there will be held the Foundry and Allied Industries Exhibition. All indications point to the Exhibition being one of the largest ever held, presenting a great number of working exhibits, showing many new developments in foundry equipment and supplies.

The tentative programme shows a well-balanced schedule of Papers and reports on practical operating and metallurgical problems of all branches of the industry. Of outstanding significance will be the session on progress in the medical, legislative and engineering aspects of safety and hygiene in the foundry. Of equal importance will be the session on apprentice training. These two subjects are of greatest current interest.

Heat-treatment of cast iron, the effect of alloys, and melting practice will be given the greatest share of attention by the grey iron foundrymen. The non-ferrous foundry sessions will feature Papers covering shop practice in the production of special bronzes. The malleable division has been fortunate in securing Papers by outstanding authorities covering sands, annealing and temperature control. General-interest Papers on refractories and sand research will also be presented. One meeting has been arranged for the discussion of shop training in engineering schools. Three Papers from European foundrymen are included in the schedule of sessions.

Technical sessions for the engineer and metallurgist, shop-course meetings for the practical production man, and round-table luncheon meetings for the informal discussion of representative foundry problems will provide an extremely busy week for those in attendance.

A complete schedule of the sessions and events of the week is given below.

Monday, May 4.

Registration: Convention Hall.
Works visit.

Tuesday, May 5.

9 a.m.—Registration: Convention Hall.

9 a.m. to 6 p.m.—Exhibits open: Convention Hall.

9 a.m.—Cast-Iron Shop Course (Session 1). Chairman, Mr. P. T. Bancroft, Moline, Ill.

Discussion Leader: Mr. E. J. Carmody, Campbell, Wyant & Cannon Foundry Company, Muskegon, Mich.

Cupola Operation and Repair.

10 a.m.—*Opening Meeting: Fortieth Annual Convention.*

Address of Welcome: Mr. Harvey Campbell, Detroit Board of Commerce.

Announcements.

President's Annual Address: Mr. D. M. Avey, Penton Publishing Company, Cleveland, Ohio.

11 a.m.—(*a*) *Non-ferrous Casting Practice*: Chairman, Mr. Jerome Strauss, Vanadium Corporation of America, Bridgeville, Pa.

Manganese Bronzes: by Dr. F. R. Hensel, P. R. Mallory Company, Indianapolis, Ind.

Pressure Castings in Aluminium Bronzes: by H. T. Ganzuage, Goulds Pumps, Inc., Seneca Falls, N.Y.

Annual Business Session—Non-ferrous Division: Report of election of officers. Report of Committee on Recommended Procedure for the Analysis of Defects.

11 a.m.—(*b*) *Malleable Cast Iron*: Chairman, Mr. P. C. DeBruyne, Moline Malleable Iron Company, St. Charles, Ill.

Malleable Sand Control, by H. W. Dietert and Mr. V. Valtier, H. W. Dietert Company, Detroit.

Report of Committee on Specifications.

12.30 p.m.—Luncheon and Round-Table Discussion—Engineering Instructors: Chairman, Mr. C. J. Freund, Dean of Engineering, University of Detroit, Detroit, Mich.

2 p.m.—*Sand Research*: Chairman, Mr. R. F. Harrington, Hunt-Spiller Manufacturing Corporation, Boston. Vice-Chairman, Mr. W. G. Reichert, Singer Manufacturing Company, Elizabeth, N.J.

The Constitution of Bonding Clays and its Influence on Bond Properties, by R. E. Grim, R. H. Bray, and W. F. Bradley, Illinois State Geological Survey, Urbana, Ill.

Deformation of Moulding Sand, by H. W. Dietert and R. A. Dietert, H. W. Dietert Company, Detroit, Mich.

Practical Sand Control in Grey-Iron Foundries, by H. Deane, Deere & Company, Moline, Ill.

Foundry Sand-Testing Problems at High Temperatures, by P. E. Kyle, Massachusetts Institute of Technology, Boston, Mass.

Committee Reports.

4 p.m.—Sand Control Shop Course (Session 1).

7 p.m.—Joint Dinner and Smoker, Foundry Equipment Manufacturers' Association, A.F.A., and Detroit Chapter of A.F.A.

Wednesday, May 6.

9 a.m. to 6 p.m.—Exhibits Open—Convention Hall.

9 a.m.—Cast-Iron Shop Course (Session 2): Chairman, Mr. K. H. Priestley, Eaton-Erb Foundry Company, Vassar, Mich.

Discussion Leader, Mr. Fred J. Walls, International Nickel Company, New York, N.Y.

Fundamentals in Welding Cast Iron.

10 a.m.—(*a*) *Cast Iron*: Chairman, Mr. M. Kuniansky, Lynchburg Foundry Company, Lynchburg, Va. Vice-Chairman, Mr. V. A. Crosby, Climax Molybdenum Company, Detroit.

Control of Manganese in the Cupola, by M. T. Davis, General Electric Company, Ontario, Calif.

Determining the Height of Molten Metal in the Cupola, by Carl Harmon, Chevrolet Motor Company, Saginaw, Mich.

Effect of Coke below Tuyeres, by H. Johnson and James T. MacKenzie, American Cast Iron Pipe Company, Birmingham, Ala.

(*b*) *Malleable Cast Iron*: Chairman, Mr. F. L. Wolf, Ohio Brass Company, Mansfield, Ohio. Vice-Chairman, Mr. L. N. Shannon, Stockham Pipe Fittings Company, Birmingham, Ala.

Measuring and Controlling Pouring Temperatures, by C. F. Joseph, Saginaw Malleable Iron Div., General Motors Company, Saginaw, Mich.

Metallographic Changes during Cooling between First and Second Stages of Annealing, by H. A. Schwartz and C. H. Junge, National Malleable & Steel Castings Company, Cleveland, Ohio.

Selection of Melting Furnaces for Malleable Iron, by M. G. Girshovitch and H. F. Landa, Central Institute of Scientific Research for Machine Construction, U.S.S.R.

12.30 p.m.—Luncheon and Round-Table Discussion—Non-ferrous Division: Chairman, Mr. T. C. Watts, Falcon Bronze Company, Youngstown, Ohio. Vice-Chairmen, Mr. H. J. Rowe, Aluminum Company of America, Cleveland; Mr. Harold J. Roast, Canadian Bronze Company, Montreal, P.Q.

Topics for Discussion:

1. Melting Practice (*a*) Furnace Atmosphere, (*b*) Furnace Operation.
2. Insulation of Furnaces.
3. Relation between Deoxidiser Content, Gates, Risers, Pouring Temperature, Shrinkage and Sand Attack.
4. Questions on Papers read at Convention on: (*a*) Aluminium Bronze, (*b*) Silicon Bronze, (*c*) Manganese Bronze.
5. Cast Metals Handbook—How can it be made more helpful?

2 p.m.—*Apprentice Training*: Chairman, Mr. C. J. Freund, Dean of Engineering, University of Detroit.

Foundry Apprentice Training, by Franklin R. Hoadley, Farrel-Birmingham Company, Ansonia, Conn.

Apprentice Training in Detroit Industries, by H. W. Boulton, Murray Corporation, Detroit, Mich.

Training Foundry Apprentices in Cleveland, by J. R. Goldie, Cleveland Vocational School, Cleveland Ohio.

3.30 p.m.—A.F.A. Cost Committee.

4 p.m.—Sand-Control Shop Course (Session 2).

8 p.m.—(*a*) *Foundry Refractories*: Chairman, Mr. C. E. Bales, Ironton Fire Brick Company, Ironton, Ohio. Vice-Chairman: Mr. A. H. Dierker, Engineering Experiment Station, Ohio State University, Columbus, Ohio.

Behaviour of Cupola Refractories Under Severe Operating Conditions: by J. L. Lowe, Campbell, Wyatt & Cannon Foundry Company, Muskegon, Mich.

Notes on Some Foundry Refractories: by J. D. Sullivan, Battelle Memorial Institute, Columbus, Ohio.

Overcoming Spout Trouble by Use of a Monolithic Refractory Tile Trough: by J. A. Bowers, American Cast Iron Pipe Company and Charles Green, Alabama Clay Products Company, Birmingham, Ala.

Open Forum—Insulated Ladles.

Question Box: (1) Is it possible to reduce silicon from sandstone used in the melting zone of a cupola? (2) Is it possible to reduce titanium from blocks used in the melting zone of a cupola? (3) Do fireclay shapes give better service than silica brick in some electric-furnace roofs? (4) Which is best, a firebrick bottom or a silica-sand bottom in malleable-iron furnaces? (5) What is the best type of refractory for the rotary, powdered-coal-fired type of furnace?

(*b*) *Steelfounding*: Chairman, Mr. John Howe Hall, Taylor Wharton Iron & Steel Company, High Bridge, N.J.

Cleaning Steel Castings: by Paul Dougher, American Steel Foundries, East Chicago, Ind.

Report of Committee on Test Coupons.

Report of Committee on Radiography.

Report of Representative on A.S.T.M. Committee on Specifications.

Thursday, May 7.

9 a.m. to 6 p.m.—Exhibits open: Convention Hall.

9 a.m.—Cast-Iron Shop Course (Session 3): Chairman, Mr. Leslie J. Korte, Atlas Foundry Company, Detroit.

Discussion Leader: Mr. G. P. Phillips, International Harvester Company, Chicago, Ill.

Alloys—Why Used and What They Do to Cast Iron.

10 a.m.—(*a*) *Cast Iron*: Chairman, Dr. James

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after passing examinations providing the right to letters of qualification after their names. Such a condition would enhance the standing of the foundry section of the industry and would enable the men with such recognised qualifications to get better positions.

Following the conclusion of the meeting the members were entertained to light refreshments at the College as guests of Mr. H. Richardson, Principal of the Bradford Technical College.

T. MacKenzie, American Cast Iron Pipe Company, Birmingham, Ala. Vice-Chairman, Mr. E. K. Smith, Electro Metallurgical Company, Detroit.

Notes on Fatigue Properties of Alloy Cast Iron: by H. L. Daasch, Iowa State College, Ames, Iowa.

Heat-treated Cast Iron: by M. Ballay and R. Chavy, Paris, France. Exchange Paper of the French Foundry Technical Association.

Heat-treatment by Hardening and Tempering: by J. E. Hurst, President, Institute of British Foundrymen. Exchange Paper of the Institute of British Foundrymen.

(*b*) *Non-ferrous Castings*: Chairman, Mr. H. M. St. John, Detroit Lubricator Company, Detroit. Vice-Chairman, Mr. T. E. Kihlgren, International Nickel Company, Bayonne, N.J.

Sand Castings of the Copper-Silicon Alloys: by H. A. Bedworth and V. P. Weaver, American Brass Company, Waterbury, Conn.

Founding Aluminium Bronzes: by J. E. Crown, Naval Gun Factory, Washington, D.C.

Report of Committee on Recommended Practices.

12.30 p.m.—(*a*) Luncheon and Round-Table Discussion: Steel Division. Chairman, Mr. A. H. Jameson, Malleable Iron Fittings Company, Branford, Conn.

(*b*) Luncheon and Round-Table Discussion: Malleable Division. Chairman, Mr. R. J. Teetor, Cadillac Malleable Iron Company, Cadillac, Mich.

3.30 p.m.—Annual Business Meeting.

4 p.m.—Sand-Control Shop Course (Session 3).

7 p.m.—A.F.A. Annual Dinner.

Friday, May 8.

9 a.m. to 6 p.m.—Exhibits Open—Convention Hall.

9 a.m.—Cast-Iron Shop Course (Session 4): Chairman, Mr. John Grennan, University of Michigan, Ann Arbor, Mich.

Discussion Leader, Mr. James H. Lansing, Kelsey Hayes Wheel Company, Detroit.

Use of Pulverised-Coal-Fired Rotary Furnace in Melting Cast Iron.

10 a.m.—(*a*) *Steel Founding*: Chairman, Major R. A. Bull, Consultant, Steel Foundry Practice, Chicago. Vice-Chairman, Mr. Marshall Post, Birdsboro Steel Foundry Company, Birdsboro, Pa.

Free and Hindered Contraction of Alloy Steel Castings, by C. W. Briggs and R. A. Gezelius, Naval Research Laboratory, Washington, D.C.

Report of Committee on Methods of Manufacture of Liquid Steel for Castings.

Report of Representative on Committee on Foundry Sand Research.

10 a.m.—(*b*) *Cast Iron*: Chairman, Mr. H. Bornstein, Deere & Company, Moline, Ill. Vice-Chairman, Mr. A. L. Boegehold, General Motors Corporation, Detroit.

Copper and Copper Manganese in Cast Iron, by L. W. Eastwood, C. T. Eddy and A. E. Bousu, Michigan School of Mines and Technology, Houghton, Mich.

Symposium on Alloy Cast Iron.

Report of Committee on Foundry Practice.

Report of Committee on Specific Applications.

Report of Committee on Heat-Treatment.

2 p.m.—*Progress of Medical, Legislative and Engineering Aspects of Safety and Hygiene in the Foundry*: Chairman, Mr. D. M. Avey, President, A.F.A.

Medical Aspects: Dr. R. R. Jones, Assistant Surgeon, Division of Labour Standards, U.S. Dept. of Labour, Washington, D.C.

Legislative Aspects: Voyta Wrabetz, Chairman, Industrial Commission of Wisconsin.

Open Forum: Forum Leader, Dr. J. A. Britten, Chief Surgeon, International Harvester Company, Chicago, Ill.

Saturday, May 9.

9 a.m.—Exhibits Open—Detroit Day.

4 p.m.—Exhibits Close.

Some Notes on Design*

By J. Pattison.

To-day engineers and draughtsmen have realised to some extent the wisdom of discussing their designs with the foundrymen, and understand the necessity for the avoidance of irregular shapes, for uniform section, gradual changes in section, and the arrangement of design to enable the most important part of the casting to be cast at the bottom. There is also a better appreciation of allowances of taper; the avoidance of thin ribs between heavy sections. They are probably wearied of hearing foundrymen mention it, and yet how often one sees thin sections adjoining a thick one or an intricate design to stand great pressures designed without regard for the natural characteristics of the most complex alloy used in the foundry—cast iron.

Varying thicknesses only involve varying strengths, even in the same casting, as there is a continuous increase in the strength per sq. in. as the cast section diminishes.

The results from tests on bars of varying diameters gave on 3 in. dia. bar 10.18 tons per sq. in.; on 2.2 in. dia. bars 12.05, and on 1.2 in. bars 15.65 tons per sq. in.

It is interesting to note the change in electrical resistance which increases with the size, due, of course, to a larger percentage of graphite.

Some engineer has at some time been surprised at the failure of a casting which he was sure had been given an ample safety margin—the trouble probably being the question of varying thicknesses. Maybe to combat this failure he has added more metal to the thin sections, thereby raising the cost of the casting, when a reduction of the thick section would have been both satisfactory and cheaper. One cannot always legitimately blame the engineer, sometimes the risk of failure is not lessened by the method employed in the foundry itself. It is fully realised that it is impossible to have every design of uniform section, and the production of castings in pearlitic cast iron is an attempt to supply the engineer with homogeneous castings, although they have varying thicknesses.

Sections of two flanged bushes, one of cylinder quality iron and one in Perlit iron, will show that the Brinell hardness numbers are irregular with the cylinder iron and regular with the Perlit quality. There is also a difference between the tensile strengths taken from similar positions.

This method of producing castings has not yet attained perfection, and it has limitations, as special heating arrangements are necessary for raising the temperature of the moulds before pouring. The size and structure of the casting also tend to limit the use of this method.

To continue with design, there is no doubt that simplicity in design helps to cheapen the cost of production, especially in patternmaking. Cast iron, although comparatively cheap, does not appear to have found great favour with engineers, and probably the chief obstacle to its use, apart from lack of homogeneity in varying sections as explained, is its so-called poor physical properties, such as its low tensile strength and poor elongation, although recently developed irons give physical properties that were thought unattainable but a few years ago.

Apart from the various special irons, one method which has brought a serious improvement is the addition of varying percentages of steel to the cupola charge. Large quantities of cylinder liners and the like are being cast in this metal and give up to 22 tons per sq. in. tensile and 4,000 lbs. transverse breaking load on a 1 in. sq. bar set between 12-in. centres. It is more difficult to cast in these mixtures than in ordinary cast iron, and careful control over raw materials and every stage of manufacture is necessary.

* A Short Paper read to the Lancashire Branch of the Institute of British Foundrymen.

Notes from the Branches

Sheffield.—On March 26 a number of Sheffield members of the Institute took part in a works visit to the Ketton Portland Cement Company, Limited, near Stamford. The journey from Sheffield was made by road, and the party was welcomed at the works by Councillor G. E. Marlow, director, and Mr. J. H. Billson, works manager of the company. The visitors went over the quarries, where both limestone and clay, the raw materials for cement manufacture, were found occurring naturally in close proximity. Ketton freestone, used for building purposes, also occurred in the same quarry. On the return to the offices the members were entertained to luncheon, after which Mr. Billson read his Paper on "The Manufacture of Portland Cement (Mechanical Processes)," which has already appeared in The Foundry Trade Journal.

At the conclusion of the Paper it was decided to go through the works immediately, so that the Paper could be discussed after the visitors had had the opportunity of examining the plant. The clay from the quarry was churned up with water to form a slurry, which was stored in large basins and kept agitated until it was required. At the same time the limestone was crushed, first by a large jaw crusher and subsequently by a swing hammer mill and finally by grinding mills, in which the limestone was mixed with the clay slurry. The mixed slurry then passed to storage basins, from which it was pumped into rotary cement kilns, fired by pulverised coal, and was discharged as cement clinker. The clinker was then ground, after a small addition of gypsum, and was delivered as a very fine powder to storage silos. It was then transferred, as required, to packing machines, which filled bags of various sizes with cement, weighing them before they were passed on.

The visitors then went through the laboratory, from which the manufacture of the cement is controlled at every stage, and in which the manufactured cement is tested in various ways.

The visitors were then entertained to tea, after which Mr. Arthur Whiteley, President of the Sheffield Branch, proposed, and Mr. T. R. Walker, Honorary Secretary of the Branch, seconded, a vote of thanks to the company, and paid tribute to the efforts of Mr. Marlow and Mr. Billson to make the visit instructive.

A discussion then took place on Mr. Billson's Paper, and questions were asked regarding the use of cement for the manufacture of moulds for steel castings. Mr. Walker asked whether Mr. Billson had found from experience that manganese steel gave better results than chromium steel for all the parts of the cement plant subject to wear and abrasion, in view of the fact that for some applications hardened chromium steel had been found to give the best results. Mr. Billson replied that manganese steel gave better results than chromium steel for some parts, but this was not the case everywhere, as in some types of duty the manganese steel was not subject to sufficient cold work to bring out its wear-resisting properties. When used for the jaws of mechanical navvies, for example, manganese steel gave very poor results compared with chromium steel, but if the navvies were dealing with limestone, manganese steel gave the better service.

Hardness Testing

R. A. Halloway, in "Heat-Treatment and Forging," describes and discusses the utility of the following hardness-testing apparatus: Brinell-hardness tester of the Swedish A.B. Alpha, the Avery, the Johnson tester, those made by Amsler, Alfred Herbert, Poldi, Seku and Gnome, the PZ3 and PZJ testers, the Rockwell hardness tester, the Alpha-durometer, the Shore-Monotron hardness tester, the Vickers apparatus, the Firth hardometer, the Shore retracting tester, the duroscope, and the Herbert pendulum tester.

Why Stanton-Dale Iron is used for Morris Cylinder Blocks

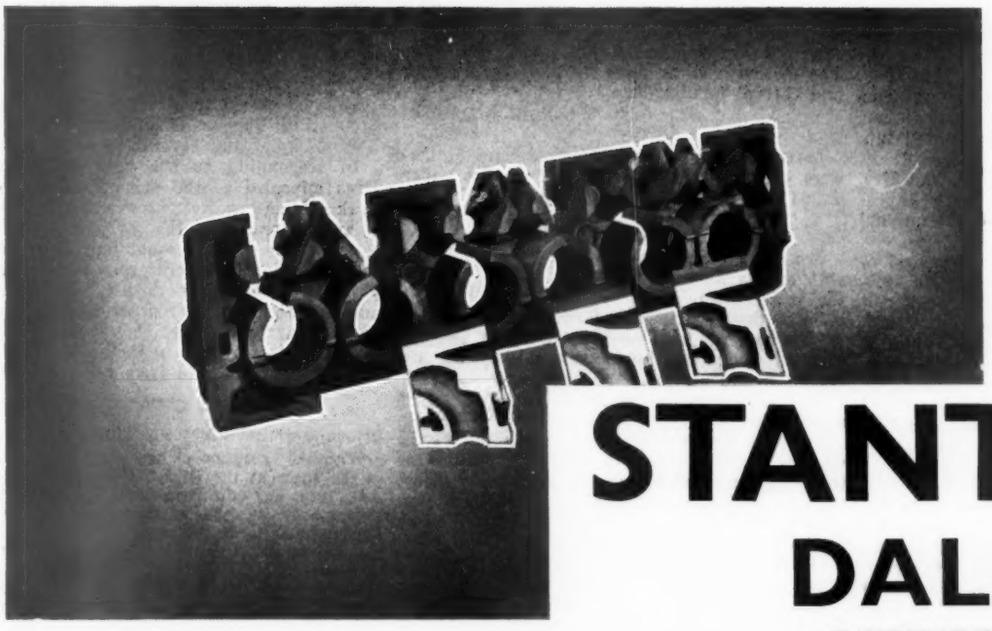
STRENGTH, machineability and resistance to wear—qualities essential in castings for intricate machinery parts—can be secured at moderate cost by the use of Stanton-Dale Refined Pig Iron.

The use of even a small proportion of this low-carbon pig iron gives the closening-up of grain, and general uniformity, which indicate superior physical properties. For this reason, Morris Motors Ltd., whose specialisation and systematic production demands consistent materials, are regular users of Stanton-Dale Iron.

Stanton-Dale Refined Pig Iron is supplied in special section clean pigs, broken into halves.

MORRIS

Full analyses of the nine standard grades will gladly be sent on request.



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DALE
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PIG IRON

The largest Producers of Foundry Pig Iron (for Sale) in Great Britain

The Stanton Ironworks Company Limited, Near Nottingham

Institute of British Foundrymen

ANNUAL MEETING OF LANCASHIRE BRANCH

The annual general meeting and election of officers for the Lancashire Branch of the Institute of British Foundrymen took place in the Engineers' Club, Albert Square, Manchester, on April 4, Mr. J. Jackson presiding over the earlier part of the proceedings. Mr. J. E. Hurst, the Institute President, was present.

The minutes of the previous annual meeting held on April 6, 1935, were unanimously approved and adopted, as was also the statement of accounts for the year ended December 31, 1935.

The Secretary's Report

The hon. secretary of the Branch, Mr. J. E. Cooke, in presenting his report of the proceedings of the Branch for the past year, stated that a most striking feature of the activities of the Branch was the development of wider interests and increasing responsibilities by the President and Branch Council.

The attendance at meetings during the winter session had been slightly above the high average of the previous session, being 96 as contrasted with 90, and all the Papers presented to the members had been of a good standard. An innovation, the "Ten Minute" Paper series, at the March meeting, proved that capable young men were vigorously pressing forward and deserved encouragement. The syllabus publication committee were to be congratulated upon their arrangements, and upon the success of the winter syllabus handbook.

Works visits to Howard & Bullough, Limited, at Accrington, and to the British Northrop Loom Company, Limited, at Blackburn, were well attended, about 120 members being present on each occasion, and the council had expressed their appreciation to the managements of those firms for courteously granting facilities to the members.

The principal social functions, the annual outing to Kirkby Lonsdale, and the annual dinner, at the Grand Hotel, Manchester, were well supported and were very successful. Mr. J. E. Hurst, the President of the Institute, and Mrs. Hurst, renewed their associations with Lancashire members as their guests at the annual dinner.

It would be observed from the statement of accounts that the income from members' subscriptions had reached a further high level, but a slight decrease in membership, from 391 to 383, had to be recorded. The continued decline in the activities of the Preston Section was mainly responsible for this, and it was fortunate that expansion continued to be the characteristic of the Burnley Section or the figures would be even more disturbing.

Junior Section's Activities

Interest in the Junior Section was growing, and attendances were increasing. Ten competitors entered for the "John Wilkinson" Medal Competition, and six for the Short Paper Competition. The annual social of the Section, held recently, was an outstanding success. The attendance of Mr. H. Winterton (Senior Vice-President of the Institute), deputising for Mr. J. E. Hurst, was a token of official recognition which was greatly appreciated by the President and Council of the Junior Section.

The evening classes for young foundrymen, at the Openshaw Municipal Technical School, were again conducted throughout the full session, but with diminished success.

Joint meetings with kindred technical societies were also held and friendly relationships maintained.

The Branch Council had had to consider and decide upon matters which had demanded much attention. The Questionnaire upon Sand Testing, issued by a sub-committee of the Technical Committee of the Institute, was at first criticised constructively, and co-operation in its distribution to Lancashire firms followed.

It had become necessary to set up a sub-committee to encourage attendances at evening classes within the area, and another sub-committee to deal with the "John Wilkinson" Medal questions and Awards.

Provision had been made also to assist the sub-committee upon Costing, who presented the second part of their preliminary report during the Winter Session.

The Branch representatives on the General Council and its Committees had faithfully carried out their duties. Upon the Technical Committee in particular they were co-operating on work in connection with new specifications for High-Duty Cast Irons, about which an important report would be issued in due course.

Mr. W. Machin, of Barrow-in-Furness, was awarded the Diploma of the Institute for the Paper entitled "Castings," presented before the Branch and later repeated at the Annual Conference in Sheffield.

During the past year Mr. S. G. Smith had retired to the South of England, Mr. W. Gilpin, a past secretary of the Branch, and Mr. Beardshaw, a member of the Branch Council, had had to suspend activities owing to ill health, Mr. J. Pell had relinquished the secretaryship of the Burnley Section, and the manifold activities of Mr. J. S. G. Primrose had been transferred to Birmingham. Worthy successors to those gentlemen would find many opportunities awaiting them.

In proposing that the secretary's report be unanimously approved and adopted the President paid a very high tribute to the services rendered to the Branch by Mr. E. J. Cooke. The motion was seconded by Mr. A. Hopwood, and carried unanimously.

Scrutineers

Messrs. Ollier, Harper, Holland, and Stafford were appointed scrutineers of the ballot papers issued for the election of officers of the Branch.

Retiring Officers

Mr. A. Phillips proposed that a very hearty vote of thanks be accorded to Mr. J. Jackson, the retiring President of the Branch, for his services during the past year. Mr. Jackson's untiring energy and progressive spirit justified them in recognising him as one of the most successful Presidents they had had of recent years.

Mr. E. Flower seconded the motion, which was carried unanimously.

The retiring President, in responding to the vote of thanks, hoped it would be possible at the next annual meeting to issue a better report concerning the Preston Section. Everything possible would be done to create a renewed interest in the study of foundry practice in that district.

The President-Elect

Mr. J. Jackson, in proposing that Mr. J. Hogg (Burnley) be elected President for the ensuing year, said that Mr. Hogg had been attached to the Branch from its inception. He understood that he was its first secretary, and carried out the duties of that office for many years. Probably no man had done more in promoting the education of foundrymen in the art of founding upon technical as well as practical lines. The prosperity of the Burnley Section was due very largely to his efforts.

Mr. J. Masters (Shrewsbury) seconded the motion.

Mr. Hogg was thereupon unanimously elected Branch-President for the ensuing year.

The newly-elected President, in returning thanks for the honour which had been conferred upon him, remarked that he could not claim to be the first secretary of the Branch. He did not regard the office as imposing a hard task upon him, particularly in view of the fine array of Past-Presidents who were prepared to assist him, and the invaluable help he would undoubtedly receive from the hon. secretary, Mr. J. E. Cooke.

Mr. J. E. Hurst, the President of the Institute, then spoke in terms of high praise with regard to the services rendered by the retiring President to the Branch, and fully endorsed the views of the members that Mr. J. Hogg would prove a worthy successor in the office.

Senior and Junior Vice-Presidents

The newly-elected President then moved that Mr. R. A. Jones (Salford) be elected Senior Vice-President. The motion was seconded by Mr. H. V. Grundy (Brooklands, Cheshire) and carried unanimously.

The newly-elected President moved that Mr. H. V. Grundy be elected Junior Vice-President. Mr. J. Jackson seconded, and the motion was carried unanimously.

Election of Other Officers

Messrs. J. E. Cooke (hon. secretary), H. Stead (assistant hon. secretary) and A. Hopwood and A. Burgess (auditors) were returned to office unopposed.

Messrs. A. Jackson, H. Stead and A. Sutcliffe were elected members of the Branch Council; Messrs. W. N. Cook, J. Jackson and A. Phillips were elected representatives on the General Council; and Messrs. J. Jackson and A. Phillips were elected representatives on the Technical Committee.

A Paper entitled "Foundry Refractories" was then presented by Mr. W. J. Rees, head of the Refractories Department of Sheffield University, which has already appeared in the issue of The Foundry Trade Journal of July 18, 1935. Owing to the lateness of the hour, it was not practicable for any discussion to follow, and it was arranged that one should take place at a convenient date during the next session.

Mr. J. Jackson moved that a cordial vote of thanks be passed to Mr. Rees for his extremely interesting Paper. This was seconded by Mr. Alec Jackson, and carried by acclamation.

In responding to the vote of thanks, Mr. Rees appealed to the members to support the work of the new Refractories Committee, particularly in regard to the carrying out of service tests, which were of equal importance as those conducted in the laboratory. He had been experimenting with refractories, both in the works and the laboratory, for practically 40 years, and he had learned long ago that it was necessary to put laboratory results to the acid test of service conditions in order to form reliable conclusions.

British Chemical Plant Exhibition

With the exception of one small stand, the whole of the space at the British Chemical Plant Exhibition, 1936, has now been taken. The Exhibition is being held at the Central Hall, Westminster, London, S.W.1, at the same time and in the same building as the International Chemical Engineering Congress of the World Power Conference, from June 22 to 27, 1936. The exhibition is a co-operative one and a number of industrial research associations are contributing on this basis and not as individual bodies. They include the National Physical Laboratory, the Fuel Research Station, the Industrial Research Council of the British Iron and Steel Federation, the British Cast Iron Research Association, and the British Electrical and Allied Industries Research Association. The following firms are among those who will be exhibiting. Ashmore, Benson, Pease & Company, Limited, British Oxygen Company, Limited, Thomas Broadbent & Sons, Limited, Brown Bayley's Steel Works, Limited, Cannon Iron Foundries, Limited, Firth Vickers Stainless Steels, Limited, Hadfields, Limited, International Combustion, Limited, George Kent, Limited, Saunders Valve Company, Limited, Siebe, Gorman & Company, Limited, United Steel Companies, Limited, and United Water Softeners, Limited.

FOR STRONG CASTINGS WHICH MACHINE PERFECTLY

WHY WORKINGTON IRONS EXCEL

POINT No. 3

THE UNITED STEEL COMPANIES LTD

LOW SULPHUR

Workington Irons are low in sulphur. For strong castings and jobs where a good surface is essential, sulphur **in the finished casting** should be kept below 0·12%—preferably about 0·08%. This reduces the liability to chill and minimises brittleness at corners and in thin sections like the fins of motor cycle cylinders.

The low sulphur content of all Workington Irons counteracts sulphur pick-up from the coke in the cupola, and from admixed scrap.

Special low sulphur and low phosphorus grades are available, from (S. and P. .02% max.) upwards.

WORKINGTON IRON AND STEEL COMPANY, WORKINGTON, CUMBERLAND
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WORKINGTON West Coast Hematite PIG IRONS

W 23

This Week's News in Brief

Trade Talk

Manufacturers of razor blades, of which there are nearly 350 in the Solingen area, are to be formed into a compulsory cartel.

The Timken Roller Bearing Company reports for 1935 a net profit of $7,484,000 (equal to $3.10 per share), compared with $3,486,000 ($1.44) for 1934.

Demag, A.-G., of Duisburg, report a net profit of 1,770,000 Rmk. for the financial year 1935, against 60,000 Rmk. in 1934. Dividends have been resumed with 5 per cent. for the year.

An order for a cargo vessel for New Zealand owners has been secured by Henry Robb, Limited, Leith. The vessel will, it is understood, be one of the largest ever built in the shipyard.

The Harland Engineering Company, Limited, Alloa, are to supply duplicate pumping machinery for Bowcome pumping station, for Newport (Isle of Wight) Town Council, at a cost of £6,576.

The Elsinore Shipbuilding & Engineering Company, Limited, have placed an order with the Stirling Boiler Company, Limited, Renfrew, for materials valued at over £16,000 for the Copenhagen Municipal Electricity Works.

The London & North Eastern Railway Company have placed orders for 500 four-wheeled bolster wagons, divided between Charles Roberts & Company, Limited, of Wakefield, and Hurst Nelson & Company, Limited, of Motherwell.

The Sheffield Metallurgical Association held a joint meeting with the Society of Chemical Industry last week. An address on "The Influence of Sulphur in Fuel on the Scaling of Steel" was given by Prof. J. W. Cobb and Mr. H. C. Millett.

Alexander Stephen & Sons, Limited, Linthouse, Glasgow, have received a contract from the Union Steamship Company of New Zealand for a 3,000-ton motor vessel. It will be 300 ft. long and is to be employed in the New Zealand coasting trade.

A mile and a half of gangway has been installed at one of the Ford factories in America for the purpose of window-cleaning. It is estimated that three months' accumulation of dirt on glass reduces the lighting efficiency in the works by about fifty per cent.

The large works at Nottingham which were formerly owned by Cammell, Laird & Company, have been purchased by Factory Owners, Limited, a recently-registered Nottingham company. The factory, which covers about 13 acres, is at present being reconditioned.

Davy Bros., Limited, of Sheffield, have decided to erect a new heavy-machine bay at their Darnall works. This bay will be served by an 80-ton crane, and the extension is necessitated by the rapidly-increasing demands of the steel industry. The extensions are being put in hand immediately.

At the annual meeting of the Derby Society of Engineers, Mr. F. Gudgeon read a Paper on "Recent Foundry Developments," in which he discussed recent developments in cast-iron treatment and foundry mechanisation. Mr. Gudgeon is the works manager of International Combustion, Limited, Derby.

At the Exhibition of English Domestic Metalwork, now being held at the Victoria and Albert Museum, one of the most interesting exhibits is a stove grate with a bronze front, lacquered brass and steel. The stove was designed by Alfred Stevens, and made by Hoole & Company, Sheffield, about the middle of the 19th century.

The Caledon Shipbuilding & Engineering Company, Limited, Dundee, have secured a contract from the Adelaide Steamship Company, Limited, of Australia, for two cargo steamers, each of 5,000 tons deadweight. The machinery, consisting of triple-expansion engines, will be constructed by John G. Kincaid & Company, Limited, Greenock.

Dorman, Long & Company, Limited, are now operating 15 of the 30 blast furnaces in blast on the North-East Coast. They lighted up an additional furnace at their Cleveland works last week-end. This is producing basic iron, but it has enabled them to transfer another furnace to the production of hematite, so that there are now nine blast furnaces on the East Coast producing hematite iron.

Reference was made by Mr. J. H. Houldsworth, chairman of the Coltness Iron Company, Limited, at the annual meeting in Glasgow, on April 9, to the considerable improvement in the profit compared with the previous year. The increase, which amounted to £34,000, was principally due, he said, to the higher selling price of coal and to better results in other departments of the company's business. It is encouraging to know that at the present time the steel foundry is fully employed and that there is work for some months ahead.

Consequent upon the recent arrangements between Colvilles, Limited, and the Steel Company of Scotland, Limited, a number of directorial changes have taken place in Colvilles, Limited, and its allied concerns. Mr. G. P. West, formerly general manager of Colvilles, has retired from the board of the Clyde Alloy Steel Company. Mr. James Colville and Mr. James McArthur, two company officials, have been elected directors. Mr. John Craig, Mr. Henry Lithgow and Dr. A. M'Cance have been elected to the board of the Steel Company of Scotland, Limited, and Mr. F. E. Rebbeck (Harland & Wolff, Limited), Mr. H. Yates (Smith & McLean) and Mr. Thos. R. Craig have joined the board of Colvilles, Limited.

Arrangements have been made by the Birmingham Aluminium Castings (1930) Company, Limited, to form a new subsidiary for the fabrication of light-metal products not now being produced by itself or its subsidiaries. Fresh capital is required. In view of the large interests already held by the company in subsidiaries and the further interest which is being acquired, the directors feel that it is desirable to form a holding company to take over its present shareholdings. The holding company will be called Birmid Industries, Limited, and both shareholders in Birmingham Aluminium Castings will be invited to exchange every three shares for four Birmid ordinary, thus obtaining an increase of one share for every three now held. These proposals are in lieu of the alternative method of giving a share bonus in the Birmingham company and increasing the capital.

Wm. Cumming & Company, Limited, the well-known ironfounders' facing manufacturers, of Glasgow and elsewhere, have just installed at their head works, at Maryhill, a new plant which seems to have solved one of the great problems of grinding material, which is to produce a result of varying grists and at the same time vary the output of each grist in such a manner as to satisfy the demand in proportion, comparable with the requirements for each particular grade. For instance, should a larger proportion of, say, fine coal dust be desired, adjustments are made which produce that in the proportion required, while should some other of the five grists be required in larger proportions, similar arrangements can be made to produce the desired results. The plant seems to have been very ingeniously designed, and we are assured it is the work of the firm's own engineering staff, whose experience in this direction is possibly unique. It is certainly very interesting to watch powdered coal dust, which has been filled into the first hopper in lumps of anything up to 2-in. dia., pouring from five different outlets in varying proportions and grists, without being handled, or even seen, after the first feed.

Company Reports

Hadfields, Limited.—Net profit, after charging debenture interest and making provision for depreciation, £116,694; preference dividend, £10,462; brought in, after deducting the arrears of preference dividend and the proportion of the writing down directed by the Court, £50,515; dividend at the rate of 7½ per cent., less tax, on the reduced ordinary share capital, £54,049; carried forward, £102,697.

Churchill Machine Tool Company, Limited.—Net profit for 1935, including £17,000 transferred from debtors' reserve, £51,406; brought in, £21,884; to reserve, £17,000; preference dividend at 6 per cent. for years 1930, 1931, 1932, 1933 and 1934 paid during 1935, £26,756; dividend of 12 per cent. on preference shares proposed, £10,695; dividend of 12 per cent. on the ordinary shares, £6,003; carried forward, £12,835.

Stewarts and Lloyds, Limited.—Preliminary statement shows that the profits, after providing for debenture interest and taxation, but before providing for depreciation for the year 1935, amount (subject to final audit) to £800,534. It is proposed to pay on the deferred shares a dividend of 1s. a share, or 5 per cent., for the year, and on the liaison deferred shares a dividend at the same rate relatively as the deferred shares.

Personal

Mr. T. H. Hawley, who for the past seven years has been foundry manager and representative with J. & T. Boyd, Limited, of Shettleston, near Glasgow, has relinquished his position.

The Lord Mayor and Lady Mayoress of London (Sir Percy and Lady Vincent) will make a tour of the Vickers Works of the English Steel Corporation during their visit to Sheffield on June 29, on the occasion of the Forfeit Feast of the Cutlers' Company.

Mr. C. F. Bishop has been appointed a director of Thos. W. Ward, Limited, of Sheffield. He has been long connected with the coke and mineral side of the business and is in charge of the road material activities. The company have also appointed Mr. J. Bussey, M.I.Struct.E., Mr. Arnold Carr, Mr. H. W. Secker and Mr. H. Vernon to be local directors.

A dinner was held at the Holborn Restaurant, London, recently, on the occasion of the retirement of Mr. T. U. Hill, London manager of the Carborundum Company, Limited, abrasive and refractory manufacturers, Trafford Park, Manchester. Mr. Hill has been associated with the company for 30 years. Presentations were made by the directors and also by the sales managers and London staff.

Officials and staff of the Coltness Iron Company, Limited, met in the Grosvenor Restaurant, Glasgow, last week to honour Mr. W. H. Telfer on the occasion of his retiral from the managing directorship of the company. Mr. Telfer has been appointed vice-chairman of the company and chairman of the Warwickshire Coal Company, Limited. He has been succeeded as managing director by Mr. D. J. Barr. Mr. A. M. Ritchie, general manager of Coltness Iron Company, presided over a large company at dinner.

Obituary

Mr. Charles Wilson, founder of the firm of Charles Wilson, Limited, ironfounders, of Atlas Foundry, Sheffield, died on April 4 at the age of 82 years.

Mr. William Dean, who died recently at the age of 82, was until his retirement a foreman moulder at the Staveley works, where he had been employed for 40 years. He was also at the Stanton Ironworks for 16 years.

Contracts Open

London, S.E., April 24.—25-ton crane with electric hoist; one (or two) 15-ton cranes, hand-operated; one pulley block, 15-ton, hand-operated, for the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1. (Fee 5s., non-returnable.)

Ormskirk, April 25.—Electrical pumping plant, for the Urban District Council. Mr. J. Haydn Thomas, clerk, Council Offices, Ormskirk, Lancs. (Fee £3 3s., returnable.)

Wellington, May 5.—Two-ton capacity hand-operated jib crane, for the New Zealand Government Public Works Department. The Department of Overseas Trade. (Reference T.Y. 30,023.)

Forthcoming Events

APRIL 21.

Institute of Welding, North-Eastern Branch:—Annual Meeting; a film will be shown, at the Institute of Mining and Mechanical Engineers, Neville Hall, Westgate Road, Newcastle-upon-Tyne, at 7 p.m.

APRIL 24.

Institution of Mechanical Engineers:—General Meeting; Second Report of the Welding Research Committee, at Storey's Gate, St. James's Park, London, S.W.1.

Chemical Engineering Group:—Annual Meeting, at Burlington House, London, W.1.

Institute of British Foundrymen

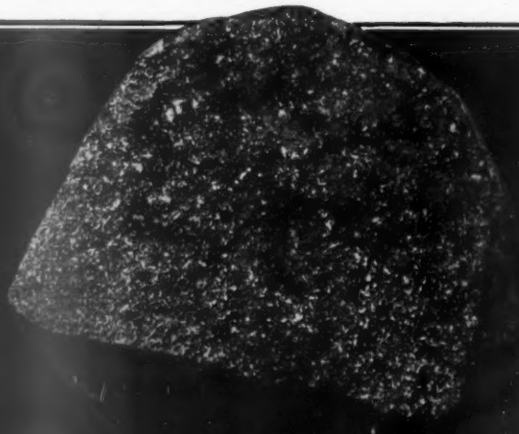
APRIL 17.

Middlesbrough Branch:—Annual Meeting, at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough, at 7.45 p.m.

Sheffield Branch:—Annual Meeting; "Cast Iron," Paper by W. Woodhouse, at the Grand Hotel, Sheffield, at 7.30 p.m.

West Riding of Yorkshire Branch:—"Oil Engine Castings" (Third Series), Paper by H. E. Beardshaw, at the Technical College, Bradford, at 6.30 p.m.

DORMAN LONG



Manufacturers of FOUNDRY, BASIC and HEMATITE qualities. Delivery from stock. Booklet giving analyses, etc., will be sent on request.

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MESSRS. J. & A. McMORLAND,
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PIG IRON

WARNER Special PIG IRONS

- Warner C.B.R. and
- Low Carbon Cylinder
(FOR CYLINDERS, ROLLS, ENGINEERING CASTINGS, ETC.)
- Low Carbon Malleable
(FOR MALLEABLE CASTINGS OF ALL DESCRIPTIONS)

Supplied to any specification between limits of 2·00 and 3·50% Carbon and ·50% and 3·50% Silicon

● ACTUAL ANALYSIS CERTIFICATES ARE AVAILABLE WITH EACH DELIVERY

● **Typical Cylinder Pig Iron Specification**

TOTAL CARBON	2·70%
SILICON	1·80%
MANGANESE	·90%
SULPHUR	·06%
PHOSPHORUS	·40%

● **Typical Malleable Pig Iron Specification**

TOTAL CARBON	2·60%
SILICON	·75%
MANGANESE	·50%
SULPHUR	·05%
PHOSPHORUS	·06%

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CARGO FLEET : MIDDLESBROUGH

Raw Material Markets

Steel for shipbuilding, constructional and railway purposes is in heavy demand. The Admiralty is expected to place orders for five destroyers on the Clyde and four on the Tyne. If these contracts materialise the high rate of activity of the steelworks in the North will be still further assured over a considerable period. Prices of finished steel are likely to be raised in the near future, following the increasing costs of raw materials.

Pig-Iron

MIDDLESBROUGH.—Consumers of pig-iron continue to press the producers for supplies, but their requirements are not easily met while the steelworks are taking up such large tonnages. Supplies of iron from the Midlands are now on a reduced scale. When producers' outputs allow a resumption of trade in normal volume it is generally anticipated that prices will be advanced. A premium of 5s. per ton is already indicated for deliveries after the end of June. Current quotations are on the basis of No. 3 Cleveland G.M.B. at 70s. per ton in the Middlesbrough or Falkirk areas, 72s. elsewhere on the North-East Coast and 73s. in Glasgow.

There has been a further increase in the output of hematite in this area by the transference of a furnace, hitherto making basic, to the production of hematite iron. As a result, deliveries, which have fallen into arrears, are likely to be made on a more satisfactory scale. Contracts are now being arranged on the basis of the recently advanced prices, but it is expected that there will be a further rise in quotations after the end of July, owing to the greatly increased costs of production. The official figure for No. 1 East Coast hematite is 77s. per ton on the North-East Coast and in Scotland, with varying increases for other areas.

LANCASHIRE.—Deliveries of iron to Lancashire users during March were the most satisfactory for several years. Textile-machinery manufacture is the only branch of the foundry trade in this area which is not well employed. Other sections of the industry are all taking up large quantities of iron. Offers of Derbyshire and Staffordshire brands of No. 3 foundry iron for delivery to Lancashire users are on the basis of 78s. per ton up to the end of June and 83s. after that date, Northants at 76s. 6d. and 81s. 6d., and Derbyshire forge iron at 74s. and 79s. For delivery equal to Manchester Scottish foundry iron is quoted at around 89s. Business in this material is on a moderate scale. Supplies of West Coast hematite are scarce and prices are very firm at around 85s. 6d., delivered to Manchester users, with East Coast hematite at 84s. 6d.

MIDLANDS.—Most users of foundry pig-iron in this area are well employed and are covered for supplies over several months. The light-castings makers, the general engineering concerns and the jobbing founders are all taking up satisfactory tonnages. The controlled quotations for Midland brands of foundry iron, including delivery to Birmingham and Black Country stations, are 72s. 6d. per ton for Northants No. 3 and 75s. for Derbyshire, Lincolnshire and North Staffordshire No. 3. These prices are subject to a small sliding-scale rebate to large users. Ordinary foundry iron is still obtainable, but stocks are low and stringent conditions may prevail in the course of the next month or so. Values of the better qualities of iron remain unchanged and the general engineering and motor concerns are taking up large tonnages. Medium-phosphorus iron is on offer at from 80s. to 87s. 6d., and low-phosphorus from 92s. 6d. to 100s., while refined iron ranges from £6 10s. to £7 15s. per ton, delivered this district. Prices of hematite have only been fixed till the end of July and any business that is arranged for delivery after that period will be at the values in force at the time of delivery. As a result forward business is not viewed with favour. Current Association quotations delivered Birmingham and Midland stations are £4 8s. 6d. for mixed numbers of West Coast hematite and £4 7s. 6d. for East Coast No. 3, while Welsh mixed numbers are £4 7s. An extra 1s. 6d. per ton is charged for delivery into Midland works.

SCOTLAND.—Firm conditions continue to prevail in this area and iron is going into consumption on a good scale. The official minimum price of 79s. for No. 3 foundry at furnaces, with 2s. 6d. per ton extra for No. 1 remains unchanged. The light-castings manufacturers are still complaining of their inability to secure supplies of Middlesbrough iron. Prices are unaltered, No. 3 Middlesbrough iron being 70s. f.o.t. Falkirk and 73s. f.o.t. Glasgow. The value of other English foundry iron is nominally 1s. 3d. per ton less than the foregoing figures, but business has been transacted at a much higher level. The steelmakers remain fully active. The price of basic iron remains at 70s., less 5s. rebate. Hematite is quoted at 77s.

Coke

Firm conditions prevail in the foundry coke market and prices are not expected to be lowered for several months. On the contrary, the demand is such that, if anything, increased values will rule. For delivery in the Birmingham district best Durham coke is quoted from 41s. 6d. to 43s., while Welsh coke varies from 38s. 6d. up to 50s. per ton.

Steel

The Easter vacation was made as short as possible at most of the steelworks and they are again working to capacity. Their current output is fully absorbed and stocks are low. Business in the semi-finished market is active and the replacement of expired contracts is sometimes difficult. Finished steel is also well taken up and little surplus material is available after consumers' requirements have been satisfied. Deliveries are fairly well maintained, but some inconvenience has been caused to consumers by the shortage of rolling stock.

Scrap

Most of the works in the Cleveland area are well employed and work was continued during the holiday period. Good, heavy, melting steel remains at 57s. 6d. per ton at the works, while a steady demand exists for good machinery cast-iron scrap at the unchanged price of 65s. Ordinary heavy foundry metal ranges from 60s. to 62s. 6d. The demand for all qualities of scrap on the Midlands market is maintained on a steady level. Good, heavy, wrought iron is at 67s. 6d. to 70s., while short, heavy, steel scrap, as used in the foundries, is at 65s. to 67s. 6d., this price being paid for good-sized parcels. Heavy machinery metal in cupola sizes is at 67s. 6d. to 70s., good heavy at 60s., and clean light at 52s. 6d. to 55s. per ton delivered works. Supplies of scrap on the Scottish market are moving into consumption more freely and most qualities are obtainable without delay. Prices remain very firm. Heavy, mild-steel melting scrap is unchanged at 57s. 6d., with heavy basic or heavy iron and steel scrap mixed, all in furnace sizes, at 52s. 6d. Wrought-iron piling scrap remains at 70s., with 2s. 6d. to 3s. 6d. extra for special quality. Heavy machinery cast-iron scrap, in pieces not exceeding 1 cwt. is at 70s. to 72s. 6d., and ordinary cast iron, to the same specification, is around 67s. 6d. per ton, delivered f.o.t. consumers' works.

Metals

Copper.—In spite of the expected slackening in demand due to the Easter recess, the tone of this market has been quite good during the past week. Steady conditions are likely to continue over the next week or two. In the United States the question of prices has caused concern for a considerable period, but it is now settled and this week has seen the last sale of copper at 9¼ cents a pound. There will now be only one price—9½ cents. On behalf of the copper-producing companies operating under the restriction scheme, it is now officially announced that the arrangements for copper production and marketing agreed upon in New York during March, 1935, have been renewed.

Daily market prices :—

Cash.—Wednesday, £36 13s. 9d. to £36 16s. 3d.; Thursday, £36 17s. 6d. to £36 18s. 9d.; Tuesday, £37 3s. 9d. to £37 5s.; Wednesday, £37 3s. 9d. to £37 5s.

Three Months.—Wednesday, £37 to £37 2s. 6d.; Thursday, £37 3s. 9d. to £37 5s.; Tuesday, £37 10s. to £37 11s. 3d.; Wednesday, £37 10s. to £37 11s. 3d.

Tin.—Prices have eased and buying has been on a low scale. Consumption is maintained at a satisfactory rate. Business in the United States is fairly substantial.

Metal Exchange quotations were as follow :—

Cash.—Wednesday, £211 to £211 5s.; Thursday, £210 10s. to £211; Tuesday, £210 10s. to £210 15s.; Wednesday, £209 10s. to £209 15s.

Three Months.—Wednesday, £203 15s. to £204; Thursday, £203 15s. to £204; Tuesday, £204 to £204 5s.; Wednesday, £203 15s. to £204.

Spelter.—Little activity has been seen in this market recently and the outlook remains obscure. Confidence seems to have left the market and consumers, with the exception of the brass-making concerns, are not entering the market for substantial tonnages.

Official quotations were as follow :—

Ordinary.—Wednesday, £15 3s. 9d.; Thursday, £15 2s. 6d.; Tuesday, £15 2s. 6d.; Wednesday, £15 1s. 3d.

Lead.—Featureless conditions have prevailed in this market recently and buying is on a low scale. However, now that the Easter holidays have passed the European building season should soon be in full swing and the demand for pipes and sheets is expected to be heavy. Producers in the United States are well booked for some time ahead.

Day-to-day quotations :—

Soft Foreign (Prompt).—Wednesday, £15 18s. 9d.; Thursday, £15 18s. 9d.; Tuesday, £16 1s. 3d.; Wednesday, £16.

Correspondence

[*We accept no responsibility for the statements made or the opinions expressed by our correspondents.*]

The East Anglian Section

To the Editor of The Foundry Trade Journal.

Sir,—I read with very great interest the report published in The Foundry Trade Journal issue of April 2 concerning the recent inaugural meeting, which took place in Ipswich, with a view to forming an East Anglian Section of the Institute of British Foundrymen.

I regretted very much being unable to attend the meeting owing to indisposition, but should like to say that I think there is every chance of forming a very successful section in this area, and that it will have the unqualified support of my company, in addition to my personal help as far as ever possible.

As you point out in one of your leaders, "Complete Coverage," published in the same issue, there are ample foundries in this district to ensure the success of the new Branch if only each foundry will add its quota, however small.

I must say that I have been very pleasantly surprised at the enthusiasm displayed by various members of the foundry staff of my company when they were approached in this matter, and I am sure that if the management of firms operating foundries in the district approached particularly the younger members of their technical staff they would meet with the same enthusiastic response.

Everything has to have a small beginning, and your reference in the leader to the small audience which attended the Birmingham Branch on occasions some 15 years ago bears this out, for to-day the Birmingham Branch is possibly second only in strength of members, and it is known that most of their meetings are very well attended.—Yours, etc.,

H. H. Shepherd,
Chief Metallurgist.

Crane, Limited,
Ipswich.

New Company

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

Israel Newton & Sons, Limited, Summerley Works, Idle, Bradford.—Nominal capital £5,000. Ironmasters and founders, etc. Directors: H. Newton and W. Newton.

CROSSING THE BORDER

and the penalty

YOU see there are many good Iron Founders in the Midlands, and in the South for that matter, who have a secret yearning to mould again with a genuine Scottish Rock Sand, such as perhaps they have once been used to. They like the heavy bond, the coarse grains, the high permeability . . . Others have never known such luxuries.

The trouble comes from not being able to move large chunks of mother-earth down South from the banks and braes without the penalty of spending a lot of money—a deplorable thought!

But the merrily tapping of wayside rocks with our little geological hammers and our love of digging holes have taken effect. We've discovered nature's bounty in a natural rock moulding sand within easy reach of *the Midlands*. (EUREKA!)

It is christened Tor Rock Sand, and we baptize it with just enough water in a painstaking mill to give a wonderfully plastic, coarse, cohesive sand—a moulder's delight.

The scientific fellows say it's like this:—

CHEMICAL ANALYSIS.

Silica	86·8 %
Ferric Oxide	1·43%
Alumina	7·6 %
Lime	·22%
Magnesia	·18%
Titanic Oxide	·18%
Alkalies	1·8 %
Loss on ignition	1·6 %

MECHANICAL ANALYSIS.

Very Coarse Sand (+ 1 mm) ..	16·5%
Coarse Sand (+·5 mm − 1 mm) ..	16·0%
Medium Sand (+ ·25 mm − ·5 mm)	11·0%
Fine Sand (+ ·1 mm − ·25 mm) ..	30·0%
Silt Grade (+ ·01 mm − ·1 mm) ..	7·0%
Clay Grade (− ·01 mm)	19·5%

which doesn't explain everything, but we will if you will write to us.

GENERAL REFRACTORIES

LIMITED

Genefax House, Sheffield

Telephone: Sheffield 31113 (6 lines).
Telegrams: "Genefax, Sheffield."

LONDON OFFICE:
Russell House, Adelphi, W.C.2.
Telephone: Temple Bar 7361.
Telegrams: "Genefax, Rand-London."

SCOTTISH OFFICE:
156, St. Vincent Street, Glasgow.
Telephone: 5250.
Telegrams: "Genefax, Glasgow."

SOUTH WALES OFFICE:
11, Wind Street Swansea.
Telephone: 3680.
Telegrams: "Genefax, Swansea."

and Branch Offices, Works and Agencies throughout the world.

RAW MATERIALS—PRICE LIST

(Wednesday, April 15, 1936)

COPPER

	£	s.	d.
Standard cash	37	3	9
Three months	37	10	0
Electrolytic	41	10	0
Tough	39	15	0
Best selected	40	5	0
Sheets	68	0	0
India	50	15	0
Wire bars	41	15	0
Ingot bars	41	15	0
H.C. wire rods	45	5	0
Off. av. cash, Mar.	36	1	5 9/11
Do., 3 mths., Mar.	36	8	5 13/23
Do., Sttlmnt., Mar.	36	1	3
Do., Electro, Mar.	40	8	6 21/23
Do., B.S., Mar.	40	0	3 1/3
Do., wire bars, Mar.	40	12	7 1/11
Solid drawn tubes			10½d.
Brazed tubes			10½d.
Wire			6¼d.

BRASS

Solid drawn tubes	9½d.
Brazed tubes	11½d.
Rods, drawn	8½d.
Rods, extd. or rlld.	5d.
Sheets to 10 w.g.	8d.
Wire	7½d.
Rolled metal	7½d.
Yellow metal rods	5d.
Do. 4 × 4 Squares	5½d.
Do. 4 × 3 Sheets	5½d.

TIN

	£	s.	d.
Standard cash	209	10	0
Three months	203	15	0
English	209	10	0
Bars	210	10	0
Straits	210	0	0
Australian	209	10	0
Eastern	207	17	6
Banca	210	0	0
Off. av. cash, Mar.	213	7	3 3/11
Do., 3 mths., Mar.	204	14	8 13/23
Do., Sttlmt., Mar.	213	5	2 8/11

SPELTER

	£	s.	d.
Ordinary	15	1	3
Remelted	13	0	0
Hard	12	0	0
Electro 99.9	17	5	0
English	16	0	0
India	13	0	0
Zinc dust	19	10	0
Zinc ashes	4	5	0
Off. aver., Mar.	16	1	8 3/4 6/11
Aver. spot, Mar.	15	19	7 10/11

LEAD

	£	s.	d.
Soft foreign ppt.	16	0	0
Empire (nom.)	16	16	3
English	18	0	0
Off. average, Mar.	16	13	9
Average spot, Mar.	16	12	1 10/11

ALUMINIUM

Ingots	£100 to £105
Wire	1/3 to 1/4 lb.
Sheet and foil	1/2 to 1/4 lb.

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	23	0	0
Do., V.M. ex-whse.	24	15	0
Rods	27	10	0

ANTIMONY

	£	s.	d.		£	s.	d.
English	72	0	0	to	73	0	0
Chinese, ex-whse.					59	0	0
Crude, c.i.f.					31	10	0

QUICKSILVER

Quicksilver	12	0	0	to	12	11	0

FERRO-ALLOYS AND STEEL-MAKING METALS

Ferro-silicon—	
25%	£8 17 6
45/50%	£12 15 0
75%	£17 17 6
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free	4/6 lb. Mo.
Ferro-titanium—	
20/25% carbon-free	5d. lb.
Ferro-phosphorus, 20/25%	£21 0 0 to £22 0 0
Ferro-tungsten—	
80/85%	3/- lb.
Tungsten metal powder—	
98/99%	3/3 lb.
Ferro-chrome—	
2/4% car.	£33 0 0
4/6% car.	£21 15 0
6/8% car.	£21 0 0
8/10% car.	£21 0 0
Ferro-chrome—	
Max. 2% car.	£33 10 0
Max. 1% car.	£36 5 0
Max. 0.70% car.	£37 5 0
70% carbon-free	9½d. lb.
Nickel—99.5/100%	£200 to £205
"F" nickel shot	£184 0 0
Ferro-cobalt, 98/99%	5/6 to 5/9 lb.
Metallic chromium—	
96/98%	2/5 lb.
Ferro-manganese (net)—	
76/80% loose	£11 5 0 to £11 15 0
76/80% packed	£12 5 0 to £12 15 0
76/80% export	(nom.) £10 5 0
Metallic manganese—	
94/96% carbon-free	1/3 lb.

Per ton unless otherwise stated. basis 2-ton lots.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 1/16 in.	1/- lb.
Flats, ¼ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ¼ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP

	£	s.	d.		£	s.	d.
South Wales—							
Heavy steel	3	5	0	to	3	6	6
Mixed iron and steel	3	0	0	to	3	1	0
Heavy cast iron					3	0	0
Good machinery					3	5	0
Cleveland—							
Heavy steel					2	17	6
Steel turnings					2	0	0
Heavy cast iron	3	0	0	to	3	2	6
Heavy machinery					3	5	0
Midlands—							
Light cast-iron scrap	2	12	6	to	2	15	0
Heavy wrought iron	3	7	6	to	3	10	0
Steel turnings					2	2	6
Scotland—							
Heavy steel					2	17	6
Ordinary cast iron					3	7	6
Engineers' turnings					2	2	6
Cast-iron borings	1	17	6	to	1	18	6
Wrot-iron piling					3	10	0
Heavy machinery					3	10	0

London—Merchants' buying prices, delivered yard.

	£	s.	d.
Copper (clean)	30	0	0
Brass	20	0	0
Lead (less usual draft)	15	0	0
Tea lead	11	0	0
Zinc	10	0	0
New aluminium cuttings	76	0	0
Braziery copper	27	0	0
Gunmetal	28	0	0
Hollow pewter	160	0	0
Shaped black pewter	120	0	0

PIG-IRON

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	72/6
,, No. 3	70/-
,, at Falkirk	70/-
,, at Glasgow	73/-
,, No. 4	69/-
Forge No. 4	69/-
Hematite No. 1	77/-
Hematite M/Nos.	76/6
N.W. Coast—	
Hem. M/Nos. d/d Glas.	77/-
,, d/d Birm.	88/6
Malleable iron d/d Birm.	119/-
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	71/-
,, No. 3 fdry.	75/-
Northants forge	68/6
,, fdry. No. 3	72/6
,, fdry. No. 1	75/6
Derbyshire forge	71/-
,, fdry. No. 3	75/-
,, fdry. No. 1	78/-
Scotland—	
Foundry, No. 1, f.o.t.	81/6
,, No. 3, f.o.t.	79/-
Hem. M/Nos. d/d	77/-
Sheffield (d/d district)—	
Derby forge	68/6
,, fdry. No. 3	72/6
Lincs forge	68/6
,, fdry. No. 3	72/6
W.C. hematite	90/-
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	78/-
Staffs fdry. No. 3	78/-
Northants fdry. No. 3	76/6
Cleveland fdry. No. 3	78/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	89/-
Clyde, No. 3	89/-
Monkland, No. 3	89/-
Summerlee, No. 3	89/-
Eglinton, No. 3	89/-
Gartsherrie, No. 3	89/-
Shotts, No. 3	89/-

FINISHED IRON AND STEEL

Usual district deliveries for iron; delivered consumer's station for steel.

Iron—	£	s.	d.		£	s.	d.
Bars (cr.)					10	2	6
Nut and bolt iron	8	10	0	to	9	0	0
Hoops					11	0	0 and up.
Marked bars (Staffs) f.o.t.					12	10	0
Gas strip					11	0	0 and up.
Bolts and nuts, ¾ in. × 4 in.					15	15	0 and up.
Steel—							
Plates, ship, etc.	8	15	0	to	8	17	6
Boiler plts.	9	5	0	to	9	7	6
Chequer plts.					10	7	6
Angles					8	7	6
Tees					9	7	6
Joists					8	15	0
Rounds and squares, 3 in. to 5½ in.					9	7	6
Rounds under 3 in. to ⅝ in. (Untested)					9	1	0
Flats—8 in. wide and over					8	12	6
,, under 8 in. and over 5 in.					8	17	6
Rails, heavy	8	5	0	to	8	10	0
Fishplates					12	10	0
Hoops (Staffs)					9	16	0
Black sheets, 24g. (4-t. lots)					11	10	0
Galv. cor. shts. (,,)					13	10	0
Galv. flat shts. (,,)					14	0	0
Galv. fencing wire, 8g. plain					15	0	0
Billets, soft			5	17	6	and up.	
Billets, hard	6	17	6	to	7	2	6
Sheet bars	6	0	0	to	6	5	0
Tin bars	6	0	0	to	6	5	0

PHOSPHOR BRONZE

	Per lb. basis
Strip	10½d.
Sheet to 10 w.g.	11½d.
Wire	12½d.
Rods	11½d.
Tubes	14d.
Castings	12½d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	21.31
No. 2 foundry, Valley	19.50
No. 2 foundry, Birm.	15.50
Basic, Valley	19.00
Malleable, Valley	19.50
Grey forge, Valley	19.00
Ferro-mang. 80%, seaboard	75.00
O.-h. rails, h'y, at mill	36.37½
Billets	28.00
Sheet bars	28.00
Wire rods	38.00
	Cents.
Iron bars, Chicago	1.80
Steel bars	1.85
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.80
Steel hoops	2.10
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.10
Wire nails	2.10
Plain wire	2.30
Barbed wire, galv.	2.50
Tinplates, 100-lb. box	$5.25

COKE (at ovens)

Welsh foundry	25/- to 30/-
,, furnace	20/- to 21/-
Durham foundry	23/6 to 24/6
,, furnace	21/-
Scotland, foundry	30/-
,, furnace	25/- to 26/-

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box	18/9
,,	28×20 ,,	37/6
,,	20×10 ,,	27/-
,,	18¾×14 ,,	19/6
C.W.	20×14 ,,	15/9 to 16/3
,,	28×20 ,,	34/3
,,	20×10 ,,	23/-
,,	18¾×14 ,,	15/9 to 16/-

SWEDISH CHARCOAL IRON & STEEL

Pig-iron	£6	0	0	to	£7	0	0
Bars-hammered, basis	£16	0	0	to	£16	10	0
Bars and nail-rods, rolled, basis	£15	15	0	to	£16	0	0
Blooms	£10	0	0	to	£12	0	0
Keg steel	£30	0	0	to	£31	0	0
Faggot steel	£18	0	0	to	£23	0	0
Bars and rods dead soft, st'l	£10	0	0	to	£12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

	£	s.	d.		
April 8 ..	36	13	9	inc.	1/3
„ 9 ..	36	17	6	„	3/9
„ 14 ..	37	3	9	„	6/3
„ 15 ..	37	3	9	No	change

Standard Tin (cash)

	£	s.	d.		
April 8 ..	211	0	0	dec.	30/-
„ 9 ..	210	10	0	„	10/-
„ 14 ..	210	10	0	No	change
„ 15 ..	209	10	0	dec.	20/-

Spelter (ordinary)

	£	s.	d.		
April 8 ..	15	3	9	dec.	3/9
„ 9 ..	15	2	6	„	1/3
„ 14 ..	15	2	6	No	change
„ 15 ..	15	1	3	dec.	1/3

Zinc Sheets (English)

	£	s.	d.		
April 8 ..	22	15	0	dec.	5/-
„ 9 ..	22	15	0	No	change
„ 14 ..	23	0	0	inc.	5/-
„ 15 ..	23	0	0	No	change

Electrolytic Copper

	£	s.	d.		
April 8 ..	41	0	0	inc.	5/-
„ 9 ..	41	0	0	No	change
„ 14 ..	41	5	0	inc.	5/-
„ 15 ..	41	10	0	„	5/-

Tin (English ingots)

	£	s.	d.		
April 8 ..	211	0	0	dec.	35/-
„ 9 ..	210	10	0	„	10/-
„ 14 ..	210	10	0	No	change
„ 15 ..	209	10	0	dec.	20/-

Spelter (Electro, 99.9 per cent.)

	£	s.	d.		
April 8 ..	17	6	3	dec.	3/9
„ 9 ..	17	5	0	„	1/3
„ 14 ..	17	5	0	No	change
„ 15 ..	17	5	0	„	„

Lead (English)

	£	s.	d.		
April 8 ..	18	0	0	dec.	5/-
„ 9 ..	18	0	0	No	change
„ 14 ..	18	0	0	„	„
„ 15 ..	18	0	0	„	„

AVERAGE MONTHLY PRICES OF WEST COAST HEMATITE MIXED NUMBERS DELIVERED SHEFFIELD

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1897	51 2	49 10	48 5	47 4	47 9½	48 6	47 0	47 3	47 3	47 0	48 3½	47 11	48 2
1898	48 9	48 10	49 4	49 8½	50 10	50 3½	51 0	52 5	53 11	55 8	57 3	56 10	52 1½
1899	59 1	59 9	57 7	59 6	64 7	70 10½	76 7½	72 2	74 3	75 0	78 1½	73 3	68 5
1900	75 3½	76 10	79 10	84 6	81 4	79 1½	83 4	81 5	79 11	76 10	77 8½	68 4	78 8
1901	60 2	59 0	57 9½	57 6½	57 8	57 4½	57 8	61 0	60 0½	59 9	58 7½	56 7	58 7½
1902	56 1	57 9½	59 3½	59 9	59 10½	60 0	60 0	60 8½	61 5	61 2	59 3	59 0	59 6
1903	58 5	58 8	61 1	59 5	57 10	57 3	56 7	56 3	55 9	54 8	52 4	52 4	56 8½
1904	52 8½	53 1	53 7	54 9	54 2	53 2½	52 9	52 5	52 2½	52 7	53 1	55 11½	53 5½
1905	57 0½	56 9	58 1	58 2	56 4	55 8	55 5½	56 7	61 0	68 9	69 9	70 11½	60 5½
1906	70 4½	65 2½	63 4½	63 9	64 5	64 6	64 1	66 2½	67 3	69 4½	72 4½	78 8½	67 5
1907	77 9	72 11	71 10	73 9	79 9½	76 9	77 9	78 4	75 11	72 9½	68 6	66 7	74 4
1908	62 7	59 1	61 6½	61 6½	61 4	59 1	57 9½	56 11	60 2	59 2	58 5½	57 7	59 7½
1909	61 4	56 5	55 3	56 1	56 4	57 0	56 8	58 0	61 0	61 1½	60 7½	61 4	58 1½
1910	64 0½	64 3½	66 10½	67 6½	66 2½	65 4	64 4½	65 6½	65 2	64 10½	64 6	65 6	65 4½
1911	66 9	66 1	64 10	63 1	62 1	62 0	61 2	62 2	62 1	61 1	61 10	64 0	63 1
1912	67 0	67 0	67 0	69 3	71 9½	72 11	75 9½	79 1½	82 2½	88 0	85 3½	86 6	75 9½
1913	86 6	86 6	86 3	85 0	83 6½	80 10½	78 1	76 10½	72 6	71 0	68 0	65 3	78 4½
1914	64 6	65 4½	65 6	64 11½	64 2½	64 0	64 0	68 11½	74 6½	71 0	65 4½	69 9½	66 10½
1915	78 9	100 6	103 1	113 6	111 9	114 0	116 3	115 2½	113 8½	121 1½	131 9½	139 6½	113 3
1916	135 0	135 0	133 4	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	129 2½
1917	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6
1918	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6	127 6
1919	127 6	127 6	127 6	127 6	180 6	184 3	195 4½	204 6	204 6	204 6	204 6	204 6	174 7
1920	224 9	235 0	245 0	275 0	290 0	295 0	295 0	295 0	295 0	295 0	295 0	280 0	284 11½
1921	263 4	228 4	180 0	180 0	180 0	160 0	160 0	157 6	142 0	128 6	121 0	115 6	167 9½
1922	125 0	117 6	115 0	115 0	115 0	115 0	113 1½	104 0	105 0	105 0	106 3	110 0	112 1
1923	109 0½	116 5½	133 11½	138 3½	134 2	125 0	115 7½	111 9	110 0	110 0	113 11	115 0	119 5½
1924	115 0	115 0	114 4½	112 6	112 6	112 6	111 0	110 0	110 0	105 4½	102 6	102 6	110 3½
1925	102 6	102 6	100 0	98 6	97 6	95 1½	92 6	90 6	88 3	87 0	88 1½	88 9½	94 3½
1926	90 1½	90 0	89 8½	89 0	89 0	89 0	90 2½	91 9	94 0	97 2½	*	*	91 0
1927	95 4½	95 6	96 6	95 6	95 3	94 0	92 10½	91 6	90 6	90 6	90 6	89 6	93 1½
1928	85 0	85 3	85 5	85 0	85 3	84 9	84 0	83 9	84 0	84 0	83 1	82 6	84 4
1929	82 10½	83 6	85 0	86 9	87 0	87 0	87 3	87 2½	87 6	89 6	89 6	89 10½	86 11
1930	91 6	91 6	91 6	90 0	89 7½	88 0	87 7½	86 6	86 6	86 6	86 6	86 6	88 6½
1931	86 6	84 6	84 6	84 6	84 6	82 6	82 6	81 6	81 6	83 6	83 6	83 6	83 7
1932	83 6	83 6	83 6	85 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6
1933	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6
1934	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6	83 6
1935	83 6	83 6	83 6	83 6	83 6	83 6	85 4½	86 0	86 0	86 0	86 0	86 0	84 8½
1936	86 0	90 0	90 0	—	—	—	—	—	—	—	—	—	—

* No prices available.

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